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Editorial Notes

OUR Editorial Notes of a year ago referred to the difficulties which were brought about by the War, but it was resolved to continue publication in 1940. We have completed the year in spite of rather increased difficulties, and again it is necessary to consider our position.

As was fully expected our circulation has decreased to some extent. By the time the March number was published we had lost many subscribers, and during the whole year they numbered 300. Against that a gleam of encouragement was given by the addition of 50 new names. Had it not been for the closure of the greater part of Europe to cultural activity there was a prospect of considerable additions to our circulation on the Continent, but the succession of Countries which became shut against us made that impossible. So far the 'warnings' for 1941 are comparatively few, but from experience we know they will grow. On the whole our position, considering all things, may be described as better than could be hoped, and once more our thanks are expressed to those who have helped to bring this about.

We have been able to publish each number with the usual punctuality, and so far have reduced the year's volume by only 32 pages. We have been fortunate in securing articles, for it has to be

remembered that nearly all archaeological work in Great Britain is at a standstill, and the Continent a closed door. If there is a real trouble it is that of continuing to obtain suitable articles of real interest. We have in mind various ways by which this possible lack of material may be overcome, and shall try each quarter to produce a readable number, though at present we live somewhat from hand-to-mouth.

The future has been carefully considered and we shall use every endeavour to keep ANTIQUITY in existence, provided the support at present given by our subscribers and contributors is continued. The cost of production has increased; the subscription charged has not, nor do we intend that it shall be so long as both ends can be met. Should it mean eventually that our illustrations cannot be so numerous, and our pages must be somewhat fewer, we hope it will be accepted as a purely War-time measure. If we survive the War the endeavour will have been worth while, and we shall then look forward to ANTIQUITY giving its full measure once more without further hindrance, and with energies unimpaired in order to take part in the revival of interest in Archaeology which we have every reason to expect.

In order to attain these hopes we shall need the continued help of all our subscribers. We realize the effect of the burden of taxation imposed on every pocket, but trust that all who have the interests of Archaeology at heart will make the effort to keep ANTIQUITY on their list of indispensable needs. Here, may we say, that early payment of the subscription is worth more than it may seem. Correspondence and postage are saved, and it enables us to know where we stand. In this direction we ask everyone so disposed to use the Bank Order which is part of the usual form enclosed with the present number (except for those who already instruct their bank and those who may have paid in advance). This method is a real convenience to all concerned and its adoption now will reduce a good deal of clerical work which is otherwise involved.

The Significance of the Pentatonic Scale in Scottish Song

by E. Cecil Curwen

THE remarkable way in which the Hebrides have formed a cultural backwater was emphasized by the writer in a recent paper in Antiquity,[1] and it was there shown that in those islands the general manner of life of the Early Iron Age has survived almost to our own times. Further evidence of survivals might have been adduced from Hebridean folk-song, and it is one aspect of this that forms the subject of the present paper.

It has long been recognized that one of the salient peculiarities of Scottish song is the fact that a large proportion of the melodies are constructed on the pentatonic scale, i.e. a scale that has only five notes to the octave instead of the seven provided by the white notes of the piano keyboard. This feature was thought to be unique in Europe, and to be shared only by some of the more remote peoples of other continents. If this were a fact, it would be a very remarkable one, and one which would demand an explanation ; and as it seemed at least possible that the phenomenon might have archaeological significance, the present study was undertaken.

Definitions

First it will be desirable to define and explain some of the terms used.

(1) A *pentatonic* scale is one which consists of five notes, the sixth completing the octave. These, if played on the white notes of the piano, correspond to any of the following :—C D E – G A – C ; C D – F G A – C ; or D E – G A B – D ; or they may be taken as corresponding to all the black notes of the piano keyboard. Essentially the scale consists of a group of three notes, each separated by a tone, and another group of two notes separated by a tone ; each group being separated from the other by intervals consisting of a tone and a half. It is these two larger intervals which are sometimes spoken of as ' gaps ', and it is the filling of these gaps which leads to our ordinary seven-note scale. On the white notes the gaps correspond to the omission of F and B, or E and B, or F and C, and if these notes (or the corresponding notes in other keys) are consistently avoided in a melody, that melody is pentatonic. The rough and ready test for a pentatonic melody is to see

[1] Antiquity, 1938, xii, 261–289.

whether it can be played entirely on the black notes of the piano ; this does not, of course, apply to its harmonization, if any. Well known examples of Scottish pentatonic melodies include those of ' Auld Lang Syne ', ' Ye Banks and Braes ', the ' Skye Boat-Song ', ' The Campbells are Coming ', and the psalm-tune ' Kilmarnock '. Tunes classified as pentatonic may be (1) absolute, in which the gaps are strictly maintained throughout ; or (2) virtual, in which one or both of the gaps may occasionally be filled by unessential or passing notes without affecting the essentially pentatonic structure of the melody.[2]

(2) A *heptatonic* scale is one consisting of seven notes, the eighth completing the octave ; in the present study this term will be confined to the diatonic scale, i.e. that which corresponds to the white notes of the piano key-board. (The term ' heptatonic ' could theoretically be applied to any seven-note scale having different intervals from those of the diatonic).

(3) A *hexatonic* scale is intermediate between pentatonic and heptatonic, and, as the name implies, consists of six notes, the seventh completing the octave. It is as if one of the two ' gaps ' in the pentatonic scale had been filled in, the remaining gap corresponding to the omission of either F or B, or less commonly E or C.

The terms sub-pentatonic, sub-hexatonic, etc. may conveniently be used in connexion with melodies which, while conforming to the pentatonic or hexatonic scales, make use of fewer than the five, or the six, notes per octave, respectively.

Pentatonic and hexatonic scales are sometimes called ' gapped ' or ' transilient ' because they ' leap over ' the omitted notes.

The Distribution of Pentatonic Scales

The first step in investigating this problem is to find out the extent to which Scottish songs are actually pentatonic, and then to compare these results with comparable material from neighbouring countries. To this end I have examined over 5700 folk-melodies, mostly from northern and western Europe, but also from other parts of the world. The difficulty has been to obtain large enough collections of folk melodies that have not been ' improved ' by modern musicians ; in

[2] For pentatonic scales see Carl Engel, *The Music of the Most Ancient Nations* (1864, reprint 1929), chap. IV ; A. H. Fox Strangways, *The Music of Hindustan* (1914) ; Hjalmar Thuren, *Folkesangen paa Færøerne* (Copenhagen, 1908), 193–225 ; M. Kennedy-Fraser, *The Songs of the Hebrides*, I, xxviii–xxxiii ; *Journ. Folk Song Soc.* (London), IV, no. 16 (1911), 150–3 ; also articles in musical dictionaries.

some cases I have had to be content with very small collections, sufficient to give one an impression of their tonal habits, but not enough to give reliable percentages. These results, supplemented by the statements of other investigators, provide material for a highly significant distribution-map. As far as possible the prevalence of hexatonic scales has been taken into account at the same time.

Four collections of Scottish songs were examined, two from the Hebrides, one general Gaelic collection, and one collection of Lowland songs. The tunes of this last are partly of Highland origin, partly, perhaps, from elsewhere in the British Isles, and partly based on bagpipe airs. In this connexion it should be remembered that the ' pipes ' are of comparatively recent introduction—some four or five centuries only—and that their scale is heptatonic, with intervals which are not strictly diatonic, but resemble those of one of the Arabic scales.

Of 241 melodies in Mrs Kennedy-Fraser's *Songs of the Hebrides* (3 volumes, including melodies quoted in the Introductions), 46 per cent. are pentatonic, and a further 33 per cent. are hexatonic (i.e. 6-note scale). Of the pentatonics in this collection 18 per cent. have a compass not exceeding five notes—a feature which connotes antiquity.[3] Most of these songs have been collected in the islands of the Outer Hebrides and in Eigg. Miss Frances Tolmie's collection comes mainly from Skye,[4] and here, out of 110 melodies, we find 38 per cent. pentatonic and 50 per cent. hexatonic, 14 per cent. of the pentatonics having a restricted compass. Taking a general collection of 120 Gaelic songs, not exclusively from the islands,[5] we find 41 per cent. pentatonic, and 37 per cent. hexatonic, while of the pentatonics only 4 per cent. are of restricted compass. Finally, out of 336 Scottish songs with English words[6] we find that 31 per cent. are pentatonic, and 33 per cent. hexatonic ; none of these pentatonics have a compass restricted to five notes.

Thus we have evidence of a strong and active pentatonic tradition in Scotland, extending from the Hebrides to the Lowlands, differentiated chiefly by the progressive diminution in the proportion of restricted-compass melodies from 18 per cent. in the Outer Hebrides to *nil* in the Lowlands. From this we may infer that the extreme conservatism of the islanders has preserved the most ancient melodies. It must be emphasized in this connexion that a given melody is not necessarily

[3] Fox Strangways, *op. cit.*, 48, 123.

[4] *Journ. Folk Song Soc.* (London), IV, no. 16 (1911), 143–278.

[5] *A' Choisir Chiuil* (Bayley & Ferguson, Glasgow).

[6] *Songs of Scotland* (Boosey & Co.), 2 vols.

ancient because it is pentatonic. Out of fifteen entirely modern tunes composed by Mr Duncan Johnston, no fewer than nine are pentatonic and three hexatonic, while none of the former has restricted compass.[7] In private correspondence Mr Johnston tells me that in composing these tunes he had no thought of scales in his mind. He tells me: 'The words are composed first, and while being crooned over and over, the tune gradually adjusts itself to the measure of the words. . . . These tunes of mine came as naturally as like tunes came to my ancestors of centuries ago'. This illustrates the fact that the Scottish tendency to pentatonicity is a form of musical tradition which is intensely conservative.[8]

We must now turn to the folk-melodies of neighbouring countries for comparative material.

In four collections of Irish songs the pentatonic melodies vary from 10 to 20 per cent. and the hexatonic from 27 to 47 per cent. The *Complete Petrie Collection of Ancient Irish Music*[9] is probably the most representative, and in this Collection of over 1500 melodies the pentatonics are about 13.5 per cent. and the hexatonics 34 per cent. The Irish have such a gay and irresponsible way of embroidering their tunes with grace-notes that the difficulties of scale-analysis are considerably increased, and some discrimination is needed to distinguish melodies which are essentially pentatonic in spite of profuse ornamentation. On the whole it is probable that the percentage of pentatonics has been underestimated rather than the reverse. Only about $4\frac{1}{2}$ per cent. of these have a compass restricted to five notes.[10]

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[7] Duncan Johnston, *Cronan nan Tonn* (Glasgow, 1938).

[8] The same tendency is very evident in the compositions of John Macdonald of Oban (seven pentatonics among nine tunes examined).

[9] Edited by C. V. Stanford; Boosey & Co., 1902–5.

[10] Among Moore's *Irish Melodies* the following are virtually pentatonic: 'Erin, O Erin' (except third quarter); 'Though dark are our sorrows' (except third quarter); 'Oft in the stilly night'; 'This life is all chequer'd'; 'As vanquished Erin'; and 'I'd mourn the hopes that leave me'. Many Irish tunes have the melody-formula AABA, where A is the original theme, and B is a related, but different, piece of melody, incomplete in itself, inserted in order to break the monotony of the frequent repetition of A. That B may be much later than A is suggested by the observation that in several tunes in which A is pentatonic, B may be hexatonic, heptatonic, or even chromatic. Similarly, in Scottish tunes a very common formula is ABABA . . . etc., appearing as alternating refrain (A) and verse (B). Here again it is common to find that B is constructed on a more developed scale (e.g. hexatonic or heptatonic) than A (e.g. pentatonic). The recent addition of B to an older A is a known fact in a few instances, e.g. by John Macdonald in *Orain Caraid* (Glasgow, 1938), p. 4; and by Archibald Ferguson in *A' Choisir Chiuil*, p. 67.

Turning to Wales we find that of 312 folk-melodies preserved in the first two volumes of the *Journal of the Welsh Folk-Song Society* (1909–1925), the pentatonics amount to no more than 1 per cent., while the hexatonics are 32 per cent. In this case the heptatonics (or 7-note scales) are in the majority (67 per cent.). None of the pentatonics have restricted compass.

As for England, the 169 melodies in the first volume of the *Journal of the Folk Song Society* (1899–1904) show pentatonics 4 per cent., and hexatonics, 20 per cent. Here again, none of the former have restricted compass. Of local English collections we have the following figures: of 38 songs mostly from southeastern England,[11] three (from Sussex) are pentatonic, and 18 are hexatonic; of 27 from Somerset,[12] two are pentatonic, and three are hexatonic; finally, of 91 songs from northern England,[13] 6.6 per cent, are pentatonic, and 25 per cent. hexatonic. (Percentages are not given in the case of smaller collections because they may be misleading).

Before passing on to the Continental material we may sum up the British evidence by saying that the pentatonic tradition is very strong in Scotland, fairly strong in Ireland, and weak in Wales and England; the hexatonic, on the other hand, is almost as strong in England and Wales as in Scotland and Ireland.

Some of the Continental material can most conveniently be shown in tabular form (percentages given in brackets, but only when the number of melodies in a group exceeds 49).

District	Melodies Examined	SCALES			
		Pent.	Hex.	Hept.	Etc.
Brittany (Ducoudray)[14] ..	30	1	9	20	—
Brittany (Graves)[15] ..	30	1	8	20	1
France (Tiersot)[16] ..	60	3 (5%)	24 (40%)	33	—
Basques (Gallop)[17] ..	48	2	12	32	2

[11] Lucy Broadwood, *English Traditional Songs and Carols.*

[12] Cecil Sharp and C. L. Marson, *Folk Songs from Somerset.*

[13] J. Stokoe and S. Reay, *Songs and Ballads of Northern England.*

[14] L. A. Bourgault-Ducoudray, *Trente Mélodies populaires de Basse-Bretagne* (Paris, 1885).

[15] A. P. Graves, *The Celtic Song-Book* (1928).

[16] Julien Tiersot, *Sixty Folksongs of France* (Boston, U.S.A., 1915).

[17] R. Gallop, *Vingt-Cinq Chansons populaires d'Eskual Herria* (Bayonne, 1928); *A Book of the Basques* (1930), chap. VIII.

This group, covering western Europe between Britain and Spain, shows itself weak in pentatonics, but still strong in hexatonics.

When we turn to northern Europe we get the following results:

District	Melodies Examined	SCALES			
		Pent.	Hex.	Hept.	Etc.
Lapland (*Juoigos*)[18] ..	848	(67%)	(30%)	(2%)	(1%)
Finland (secular songs)[19]	100	(9%)	(25%)	(66%)	—
Finland (religious songs)[19]	112	0	(34%)	(66%)	—
Iceland[20]	20	1	4	15	—
Faroe Islands [21]	100	(8%)	(54%)	(38%)	—
Norway[22]	100	(4%)	(50%)	(46%)	—
Sweden[23]	50	0	(46%)	(54%)	—
Denmark[24]	32	0	7	25	—
Esthonia, Latvia and Lithuania[25]	15	1	5	8	1
Russia[26]	100	(2%)	(50%)	(48%)	—
Germany[27]	100	(2%)	(15%)	(80%)	(2%)

In addition to these Thuren states that pentatonic forms are found in the songs of two half-civilized Finno-Ugrian stocks in northeast Russia—the Tscheremiss and Wotjaks.[28]

In this northern group we note a heavy concentration of pentatonics in the extreme north (Lapland), fringed by a moderately strong pentatonic tradition in Finland, the Faroe Islands, and perhaps in northeast

[18] Armas Launis, *Lappische Juoigos-Melodien* (Mém. de la Soc. Finno-Ougrienne, XXVI, Helsingfors, 1908). I am indebted to Mrs Gudmund Hatt of Copenhagen for this reference, and for the loan of her own copy.

[19] *Suomen Kansan Sävelmiä*, vols. I and II

[20] Sv. Sveinbjörnsson, *Icelandic Folk-songs* (Edinburgh, R. W. Pentland).

[21] Hjalmar Thuren, *Folkesangen paa Færøerne* (Copenhagen, 1908).

[22] O. M. Sandvik, *Folke-musik i Gudbrandsdalen* (Christiania, 1892).

[23] Assar and Olsson, *Sverges Melodibok*, I (Stockholm).

[24] *Danmarks Melodibog* (Copenhagen).

[25] *The Botsford Collection of Folk-Songs* (New York, 1938), II.

[26] N. Rimsky-Korsakov, *A Hundred Russian Folk Songs* (St. Petersburg, 1877), collected between 1810 and 1820, mainly from the Governments of Novgorod and Orlov.

[27] A. Härtel, *Deutsches Liederlexikon* (Leipzig).

[28] Hj. Thuren, *op. cit.*, 202.

Russia. Further south the pentatonics are weak or absent, but throughout the whole group the hexatonics are numerous, with the possible exception of Germany.

Fewer melodies have been examined for southern Europe and adjacent lands, but sufficient has been done to show the general trend.

District	Melodies Examined	SCALES			
		Pent.	Hex.	Hept.	Etc.
Spain and Portugal[29] ..	16	0	1	14	1
Italy and Sicily[29]	19	0	3	14	2
Greece[30]	94	(2%)	(32%)	(55%)	(11%)
The Balkans[29]	43	1	11	26	5
Austria, Hungary, and Czechoslovakia[29] ..	30	0	5	23	2
Hungary[31]	94	0	(7%)	(69%)	(23%)
Poland[29]	16	0	2	14	0

Pentatonics in this south and southeastern area, which amount to no more than one per cent. of the whole group, seem to be confined to Greece and the Balkans. Hexatonics are numerous in the same area, but weak elsewhere.

Outside of Europe the Arabs have a highly developed heptatonic system in which pentatonic scales have little or no place.[32] The same may be said of the Hindustani system, except that in this case an earlier pentatonic system co-exists.[33] In India pentatonic scales are specially common in the Himalayas and in Bengal,[33] as well as among the hill-villages, and they seem to be particularly associated with the pre-Aryan population. Persian music is said to resemble the Hindoo (heptatonic), and we thus begin to suspect a possible correlation between heptatonic scales and Indo-European languages.

Elsewhere in Asia pentatonic scales are common, if not predominant almost everywhere—in Mongolia, China, Japan, Siam, Annam, Java,

[29] *The Botsford Collection of Folk-Songs.*

[30] *Botsford Collection*, and L. A. Bourgault-Ducoudray, *Trente Mélodies populaires de Grèce et d'Orient* (Paris, 1897); songs common to both collections counted once only.

[31] Béla Szilasi, *Hungarian Folk-Songs* (Budapest, 1935).

[32] F. Salvador-Daniel, *The Music and Musical Instruments of the Arab.*

[33] A. H. Fox Strangways, *The Music of Hindustan* (Oxford, 1914).

Sumatra, the South Sea Islands,[34] and New Guinea.[35] In China they exist side by side with a very ancient heptatonic system, to which reference will be made later.

In Africa five-note scales have been reported from the Sudan and from Zululand,[34] as well as from Nubia, Abyssinia,[36] Basutoland, and South Africa generally.[37]

In North America pentatonics are common among the Indians, Eskimos and Negroes. I have obtained the following figures from collections of songs :—

People	Melodies Examined	SCALES			
		Pent.	Hex.	Hept.	Etc.
N. American Indian[38] ..	9	7	0	1	1
Eskimo—ancient[39] ..	32	18	12	1	1
Eskimo—1750–1900[39] ..	19	1	7	10	1
Eskimo—modern[39] ..	14	1	2	7	4
Negro (Jubilee Singers)[40]	61	(49%)	(38%)	(13%)	—
Negro Slave Songs[41] ..	148	(36%)	(24%)	(36%)	(4%)
U.S.A. (all classes of population)[42]	32	15	12	4	1

As a contrast, Spanish influence in Mexico and Latin America tends to eliminate transilient scales altogether, but pentatonics reappear among the South American Indians.

[34] Hj. Thuren, *op. cit.*, 193–203.

[35] Cecil Sharp, *English Folk-Song : Some Conclusions*, 45.

[36] Carl Engel, *The Music of the Most Ancient Nations*, 157–162.

[37] *Oxford Companion to Music* (1938), s.v. ' Harmony ', §4, and ' Scales ', §10.

[38] Thurlow Lieurance, *Indian Songs* (Chappell & Co., 1913)

[39] W. Thalbitzer, *Inuit Sange og Danse* (Copenhagen, 1939). I am indebted to the author for a copy of this work.

[40] Rev. G. D. Pike, *Jubilee Singers* (London, 1873). A characteristic example is ' Swing low, sweet chariot '.

[41] W. F. Allen, etc., *Slave Songs of the United States* (New York, 1867).

[42] *Botsford Collection of Folk-songs*, 1. This mixed group includes Negro, Indian, Creole, Kentucky, Texas, Middle-West, Cowboy, and a chantey. See also *Oxford Companion to Music*, s.v. ' United States ', §§6, 7.

The Significance of the Distribution

Though it is impossible at the present time to make a complete statistical survey of folk-song scales of the whole world, yet the foregoing data are enough to give a fairly clear and consistent picture which is highly significant. Broadly speaking, we see the areas covered by Indo-European and Arabic languages as an island of heptatonic scales in an ocean of pentatonic. In Europe the few surviving pentatonic areas are on the extreme fringes of the north and northwest, including Lapland, Scotland and Ireland. It seems clear from this that the heptatonic scales have spread over this area at the expense of an earlier pentatonic system, and we may reasonably seek a single centre from which diffusion has taken place.

Now the factor that is common to all the pentatonic areas is neither racial nor linguistic but acoustic and musical. It is generally recognized that the five-note scales are earlier and more primitive than the six or seven-note scales. The form of the pentatonic scale is determined by the principles of quintal harmony, which are universal, and not subject to local usage, and the 'gaps' exist because in a purely pentatonic stage of development the ear has not yet learned to distinguish or appreciate the semitone which inevitably appears when the 'gaps' are filled in.[43] Missionaries, for instance, have reported that primitive peoples, accustomed only to pentatonic singing, are unable to sing European hymn-tunes.

The point to be emphasized in the present connexion is that the pentatonic is essentially a vocal rather than an instrumental scale. This is well illustrated by the Lapp *Juoigos* melodies, two-thirds of which are pentatonic or sub-pentatonic. A Lapp tends his reindeer on the tundras, and with wide views of lakes and mountains before him he thinks of a good friend or schemes evil against an enemy. His thoughts form into words and sounds, and so a short melody takes shape, accompanied by words consisting chiefly of names and ejaculations. In a similar way he may express his satisfaction with his beautiful herd or with the remembrance of a place or past event. In the loneliness of the tundras he repeats the tune again and again, adding, perhaps, a few descriptive words, until he has produced something which satisfies him. Subsequently he may sing his melodies in company, and the best of them, or those of which the object is generally well-known, may pass into general currency.[44]

[43] A. H. Fox Strangways, *op. cit.*, 123.

[44] Armas Launis, *op. cit.*, Introduction.

The heptatonic (seven-note), on the other hand, is an instrumental scale, associated with such musical instruments as are provided with a fixed scale of notes, such as the harp, lyre or flute. The spread of the heptatonic at the expense of the pentatonic is, therefore, a measure of the spread of such musical instruments. In recent centuries the heptatonic has also proved to be an harmonic scale, whence nearly all modern art-music, which has harmony as its basis, is either heptatonic or chromatic.

The hexatonic (six-note) scale is intermediate between these extremes. Like the pentatonic, it is melodic rather than harmonic, and it is also primarily vocal, but it is the product of people who have already become familiar with the seven-note scales of the musical instruments and their semitonal implications.

Melodies constructed on the pentatonic scale are characterized by strength and sweetness, and seem most fitted to express the strong emotions of simple folk. More sophisticated emotions demand chromatic scales. But to those of us who still like to remain simple, pentatonic melodies go right to the heart, and, to borrow Mr Fox Strangways' words, ' move us like forlorn hopes and lost joys, like the places we knew when we were children . . . they appeal by their freshness and strangeness, but still more by their intimate familiarity '.[45] This is not a mere digression into sentimentality, but an attempt to explain the persistence of the pentatonic tradition in certain areas in spite of the introduction of musical instruments having more advanced scales. This persistence will, no doubt, in its turn explain the appearance in pentatonic areas of instruments such as flutes and resonators which are tuned pentatonically rather than heptatonically[46]—in apparent contradiction to the generalization already put forward.

We have said that the spread of the heptatonic scales at the expense of the pentatonic is a measure of the spread of musical instruments such as the harp, lyre or flute, and that the heptatonic distribution corresponds roughly with the spread of the Indo-European and Arabic languages. We must now look, therefore, for the earliest origins of musical instruments having fixed scales.

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[45] A. H. Fox Strangways, *op. cit.*, 3. It is only fair to say that the words qucted referred originally to a polyphony of the Middle Ages.

[46] C. K. Wead, ' Contribution to the History of Musical Scales ', *Report of the Smithsonian Institution* (for year ending June 30, 1900), 431–2, and pl. 2, figs. 3 and 4.

The Origin of the Heptatonic Scale

Canon Galpin has fortunately provided us with the most up-to-date review of the available evidence on this subject.[47] He has shown that instruments possessing fixed scales, such as the harp, lyre and flute, can be traced back to their most primitive forms in an early phase of the rise of material civilization in western Asia and Egypt. The bow-shaped harp appears in the Jemdet Nasr period at the close of the fourth millennium B.C., and, like the lyre and flute, is considered to be of Asiatic origin. At any rate the flute found its way at a very early date to India and China, apparently carrying with it its Sumerian name and scale. Reed-blown pipes, both single and double, appear in Egypt at the very dawn of history.

The Sumerian flute, called *ti-gi* or *imin-e* was carried as far as China, and the Chinese records tell us that in the third millennium B.C. the Imperial Master of Music was sent westwards ' to study its proper ordering'. In due course he found a people in western Asia whose musical scale he adopted, and he cut his bamboo tubes to accord with the notes he had heard. On his return the scientists proceeded to develop the mathematical theory of this western scale, which was definitely heptatonic.

This account illustrates remarkably well the point we have just been making, that the seven-note is an instrumental scale, and that it is introduced with the instrument wherever the latter is adopted by pentatonic people. The reaction of conservative pentatonic tradition is also well illustrated in the case of China, for in spite of the possession of this ancient heptatonic system it was found necessary to re-establish the pentatonic scale by Imperial edict in the 15th century A.D., owing to the difficulty experienced by Chinese musicians in expressing the semitones of the seven-note scale.

Canon Galpin has been able to calculate the scale of a specimen of the Chinese vertical bronze flute, called *ti*, dating from before the twelfth century B.C., and he found that it was heptatonic, corresponding to the so-called Lydian mode, i.e. the scale of F to F on the white notes of the piano, with B natural (not flat).

The second name of the Sumerian flute, *imin-e*, means ' seven voices ', which not only indicates the scale, but also perhaps draws attention to it as a novelty. The scales of two Egyptian flutes from Beni Hasan (about 2000 B.C.) and of two reed pipes from Ur (2800 B.C.),

[47] Canon F. W. Galpin, *The Music of the Sumerians* (Cambridge, 1937).

have also been shown by Canon Galpin to correspond to the heptatonic Lydian mode. This mode, which is rare in Europe, is also found in some of the oldest vocal traditions of the Jewish Synagogue, said to have been handed down from the days of Ezra (fifth century B.C.). It is also a fundamental part of Hindoo music, and is found on the southeast coast of Arabia, as well as among the Bantu tribes of Africa.

It therefore appears that the heptatonic scale, and the musical instruments associated with it, may be added to the list of the arts of material civilization which appeared with such remarkable rapidity in the fertile river-valleys of western Asia after the stabilization of society consequent upon the ' discovery ' of agriculture. These arts, which include the cultivation of corn, the domestication of animals, the making of pottery, the working of certain metals, the building of cities, and the art of writing, diffused at very different rates into surrounding lands. The first to reach Britain were agriculture, cattle-rearing and pottery, and their introduction, as is now well realized, marks the beginning of our Neolithic period, probably somewhere during the third millennium B.C. Copper, bronze and gold followed some centuries later, but writing lagged behind for over two thousand years. If, now, we may add to this list the heptatonic scale and the harp or flute, we have to consider at what period in our prehistory these are likely to have first reached our shores.

If the arguments so far adduced are correct, the pentatonic fringe in Scotland and Ireland must represent a conservative musical tradition that has to some extent resisted absorption by the incoming heptatonic. Now the two epochs at which the introduction of the latter could most likely have taken place are the Neolithic period and the coming of the Celts in the Late Bronze and Early Iron Ages.

The Significance for the British Isles

Neolithic civilization reached Britain along two main approaches : (1) Neolithic A, characterized by ' causewayed ' camps, arrived overland from the southeast, probably crossing the Channel near its narrowest part ;[48] (2) the Megalithic culture spread coastwise along the Atlantic shores of Europe, along the sea-route that led from the Mediterranean by Gibraltar, the Spanish coast, Brittany, Cornwall, both shores of the Irish Sea, the western Highlands, the Hebrides and the Orkneys

[48] Neolithic B is not considered here, as it may have been merely a local reaction on the part of our mesolithic aborigines, as Mr Stuart Piggott has suggested.

to Scandinavia. The standards of culture that reached the British Isles by these two approaches seem to have been so far similar that it is unlikely that musical instruments, however rudimentary, would have been introduced by one route and not by the other. Now the Atlantic sea-route was of great importance at this time, and must have given rise to a somewhat homogeneous culture-group on both sides of the Irish Sea, composed of a fusion of mesolithic aborigines with megalithic traders. Although the importance of this trade-route waned during the Bronze Age, it never fell entirely into disuse, and even today it is used by the coastwise Breton onion-trade. Meanwhile the continued homogeneity of the descendants of this megalithic culture-pool is suggested by a series of distribution-maps compiled by Miss Lily F. Chitty and published by Sir Cyril Fox.[49] These show the distributions of (1) flat and hammer-flanged bronze axes ; (2) Early Bronze Age food-vessels ; (3) Late Bronze Age encrusted and (4) cordoned urns. The first covers almost the whole of the British Isles with the same types of axe at the beginning of the Bronze Age. The food-vessels, which come slightly later, cover mainly, but not exclusively, Ireland and the ' Highland Zone ' of Britain. In the Late Bronze Age the area covered by the encrusted and cordoned urns is rather more restricted, and covers little more than Scotland, Ireland, parts of northern England and western Wales. In all the maps there is a suggestion that the main trade-route may have diverged overland across the Clyde-Forth isthmus to reach the North Sea from the Irish Sea, and there are strong concentrations of dots in the northeast of Ireland.

Down to the Late Bronze Age therefore, we have reason to suppose that Scotland, Ireland, and part of Wales were occupied by a more or less homogeneous culture-group that was in the main descended from the old megalithic stock. At about this point the Celtic immigrations begin to affect both Britain and Ireland. So far as we can tell, the lowland zone of Britain was colonized by *p*-Celts[50] (or ' Brythons ') from across the Channel, while Ireland was settled by *q*-Celts (or ' Goidels ') who, according to one view, arrived by the old Atlantic

[49] *The Personality of Britain* (3rd edn., Cardiff, 1938), p. 40, and pls. II, V, VI, and VII.

[50] This refers to the linguistic division of the Celtic-speaking peoples into *p* and *q* branches, the former comprising at the present day the Welsh, Cornish and Breton stocks, and the latter the Gaelic-speaking Irish and Scottish. Where the former group uses a *p*, as in *map* (=son), the latter tends to use a *q* or *c*, as in *mac* (=son). Similar *p* and *q* variations existed between Greek and Latin, and between the dialects of ancient Italy (Latin and Oscan) and Greece (Attic and Ionic) ; also between Zend and Sanskrit.

sea-route from Spain.[51] It was not till about the fifth century A.D. that the Celts of Ireland, known as Scotti, overflowed into the western Highlands of Scotland. According to ancient Gaelic sources the pre-Celtic aborigines of both areas—Ireland and Scotland—were known as Cruithin, a term which is philologically equivalent to Pretani, by which name they were known to the *p*-Celts and ultimately to the Greeks. This, probably through confusion with the Britanni of northern Gaul, gave rise to the name of Britain.[52] The Cruithin correspond, in the view of Prof. MacNeil, to the ethnic group known as the Picts, and in Ireland their heaviest concentration was in the north-east.

We thus have three factors common to the areas in question: (1) a more or less homogeneous pre-Celtic culture-group; (2) a pre-Celtic population known as the Cruithin, or Picts; and (3) a pentatonic musical tradition which is strongest in those parts which were the latest to come under Celtic influence, viz. Scotland, and virtually absent among the *p*-Celtic people of Wales. It is difficult to resist the conclusion that the pentatonic tradition is a legacy from the pre-Celtic Picts, and that the latter, whatever their language may have been in historic times,[53] represented the old megalithic stock blended, no doubt, with Beaker or other Bronze Age elements.

Now a distinctive musical tradition is the language in which the soul or 'personality' of a people finds expression, and it can exert as great a unifying and definitive influence on an ethnic group as can ordinary language. The modern Highlander, who is sprung from Pict, Gael and Norseman, is therefore at heart a Pict, whether he speak Gaelic or English. The strong pentatonic tradition of the Picts has to a large extent resisted absorption by the musical tradition of the Celts, just as the Celtic language has displaced those of the Picts and Norsemen, while absorbing certain elements from them.[54] In the same way the strange, superstitious mysticism of the Hebrides, so commonly attributed to the 'Celts', seems much more likely to have come down from the

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[51] The support given to this view by Irish tradition is worth consideration.

[52] Eoin MacNeill, 'The Pretanic Background in Britain and Ireland', *Journ. R. Soc. Ant. Ireland*, LXIII, 1–28.

[53] J. Fraser, 'The Question of the Picts', *Scottish Gaelic Studies*, II, pt. II (1928), 172–201.

[54] 'The Gaelic vocabulary, both in Ireland and in Scotland, contains a very large pre-Celtic element'.—J. Fraser, *op. cit.*, 185.

ancient megalithic culture which was remarkable for elaborate ritual connected with death and burial.

As far, then, as the British Isles are concerned, the significance of the Scottish pentatonic lies in the indications it gives that musical instruments possessing a scale of notes, such as the harp, or crot,[55] together with the seven-note scale, were most probably first introduced by the Celtic immigrants of the Late Bronze and Early Iron Ages; further, that the survival of the pentatonic tradition in the north bears testimony to the vitality and continued entity of the pre-Celtic and pre-heptatonic Pictish element in the modern population of Scotland, and to a less extent in that of Ireland.

The Heptatonic in Europe

The arts which arose in the Near East at the dawn of civilization were taken over by Europe, one by one, and developed in a highly original way. The Sumerian heptatonic scale was not adopted slavishly. Greek music, the earliest European music of which we have detailed knowledge, had adopted the seven-note scale and developed from it a series of modes upon which early Christian and medieval Church music is said to have been based. But the character of Greek music as we have it depicted by contemporary writers a few centuries before Christ may well represent that of a considerable part of Europe at, or even before, that time. The Greeks reduced to a system what was then current practice, and we have details, not only of diatonic progression and modes, but also of enharmonic and transilient scales. It is difficult to be sure whether they recognized the true pentatonic scale. The diatonic modes are found among the folk-melodies of the greater part of Europe today, including all parts of the British Isles, and one may therefore infer that they were characteristic of the music of the early Celtic immigrants.

Summary of Conclusions

The arguments adduced in this paper may now be summarized :—

1. Musical instruments possessing fixed scales of seven notes to the octave appear for the first time at, or soon after, the dawn of material

[55] The Celtic instrument may have been the bow-shaped harp (Gk. *νάβλα*, Heb. *nebel*), or the crot or *cruit* (Gk. *κιθάρα*), a form of lyre. The triangular form of harp popularly associated with the Welsh and Irish is of northeast European origin, and was introduced to the British Isles by the Vikings; see F. W. Galpin, *A Textbook of European Musical Instruments* (1937), 79, 83.

civilization in the Near East.[56] An early partial diffusion took place into Asia as far as China, without permanently affecting the indigenous pentatonic (vocal) scales. A later and much more effective diffusion occurred, probably along with the Indo-European languages, into Iran and Hindustan, and also into Europe, resulting in the displacement of pentatonic by heptatonic scales everywhere in Europe, except in the far north and northwest, viz. Lapland, Scotland and, to a less extent, Ireland, Finland and the Faroe Islands.

2. The introduction of these musical instruments and their associated heptatonic scales into the British Isles was probably effected by the Celtic immigrants of the Late Bronze and Early Iron Ages[57], while the survival of a pentatonic musical tradition in Scotland, and to a less extent in Ireland, indicates the persistence of a conservative pre-Celtic element in the population, corresponding to the historical Picts, and ultimately derived from the megalithic culture. Nothing could better illustrate Fox's insistence on the continuity of culture in the ' highland zone ', its conservatism, and its tendency to absorb and modify immigrant cultural elements, while remaining at heart ever the same.

NOTE.—In speaking of the Scottish Picts as ' pre-Celtic ' I have used that term in relation to the Dalriadic Settlement of Argyll ; it does not exclude the possibility of some previous admixture with *p*-Celtic stock from Southern Scotland, nor the probability of *q*-Celtic admixture derived from Irish traders. The fact that the Orkneys bore a *q*-Celtic name (Orcades) in the second century A.D. (Ptolemy) may point to the regular use of the north-western sea-route by the Irish Celts long before they finally settled in Argyll.

[56] It is significant that among the city-dwelling descendants of Cain, the first cultivator of the ground, are not only the first metal worker, Tubal-Cain, but also Jubal, ' the father of all such as handle the harp and pipe ' (GENESIS, IV, 21, 22, Rev. Vers.)

[57] It may also be significant that according to Irish tradition the Milesians, who seem to correspond with the first Celtic immigrants to Ireland, are said to have been accompanied by a harper (W. H. Gratton Flood, *The Story of the Harp*, London, 1905). A detail like this, when given in connexion with a semi-mythical event is likely to have a deeper significance—e.g. the introduction of the harp—than when given in connexion with a purely historical event, such as an expedition of Edward I against the Scots.

A Croft in the Upper Nedd Valley, Ystradfellte, Brecknockshire

by Sir Cyril Fox

THE streams which unite to form the River Nedd (or Neath) flowing into Swansea Bay rise in a chain of high hills known collectively as the Fforest Fawr, and individually as Vans—Fan Gihirych, Fan Nedd, and others. These rapid streams flow in deep and picturesque gorges across an upland region floored with carboniferous limestone, descending, near Pont-Nedd-Fechan, to the main valley of the Nedd, 15 miles from the sea.

This upland region, illustrated in FIG. 1, was much sought after by early man : we know for example that it was a meeting place of B^1 (Wessex) and A (East Anglian) Beaker cultures. At a later date an important Roman road, one of the many ' Sarn Helen's ', traversed it ; and chieftains cherishing Roman traditions lived in it in the sixth century, as the memorial of Dervacus the son of Justus (PLATE II), sited between the Llia and the Upper Nedd, testifies. Today the region is a sparsely populated sheepwalk.

In the upper valley of the Nedd the highest inhabited house is Coed-y-Garreg, about 1050 feet above sea level. Two-thirds of a mile further up the valley, where the bare upland is dominated by Fan Nedd (2178 ft.) is a farm named Blaen-Nedd-uchaf, deserted it would appear in the 19th century. No human habitations are marked on the 6-inch map (Breck. XXXVII SE) above this point; but in Nant-y-moch (FIG. 1), 300 yards from the junction of its stream with the Nedd and 700 yards above Blaen-Nedd-uchaf, my wife noticed a ruined croft, the subject of this note. It is in Ystradfellte parish, about 1250 feet above Ordnance datum (PLATE II).

FIG. 2 and PLATE III illustrate the steading and its site. It is in a sheltered position on the north side of the *nant*, on a comparatively easy and deep-soiled slope above the grassy rocky scarp bordering the stream bed. The shelf is, however, narrow, and the upper part of the house, which is set with its long axis at right angles to the contours, is deeply excavated into a rapidly steepening hill.

The ford shown on the plan (FIG. 2) leads to a steep path up the south flank of the *nant* (from which the photograph was taken) and no wheeled vehicle could ever have reached the croft. This accounts

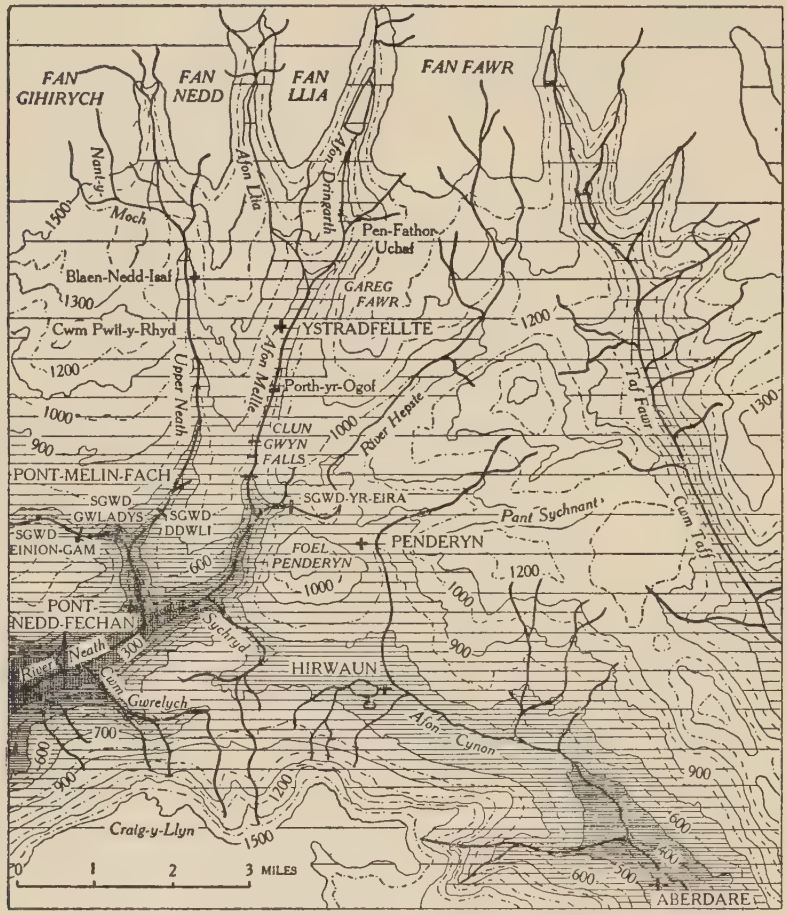

FIG. 1. MAP OF THE COUNTRY AROUND YSTRADFELLTE
From 'The River Scenery at the Head of the Vale of Neath', by Dr F. J. North
By permission of the National Museum of Wales

for the narrow (2 ft. 9 in.–3 ft. 0 in.) gaps in the wall of the yard, suited for cattle or sheep, pack-ponies, or folk on foot only. The roughly-aligned passage from the yard-gate downwards leads to a gravelled embayment in the rock-floored bed of the stream where animals could

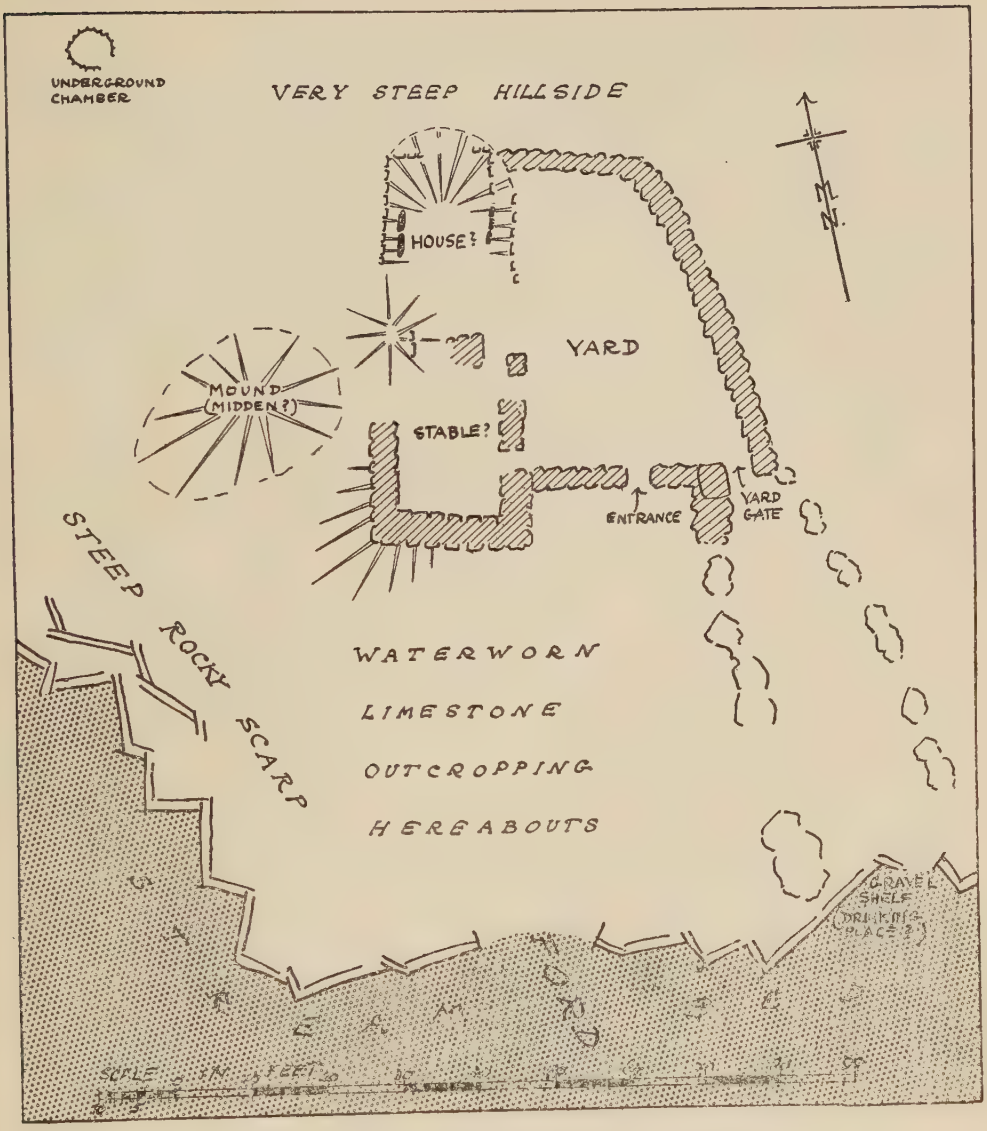

FIG. 2. SKETCH PLAN OF THE CROFT, NANT-Y-MOCH
(*see* pp. 363, 364)

drink without being endangered by floods. Adjacent to the croft on the west is a grassy mound, possibly a midden.[1]

The building is shown on a larger scale in FIG. 3. It is completely ruined and many features of its construction are obscure ; but a careful examination, in relation to the ground levels, of every stone of its structure now visible, enables its main characteristics to be determined.

It is built on an artificial platform levelled into the hillside, but the extent of excavation (or construction) required on such a slope is lessened by the fact that the house is on two levels, the upper two feet above the lower. The lower end then is slightly above the natural ground, the upper end much below it ; in the centre natural and artificial levels approximate. The two levels are defined by a cross-wall, which separates the building into two parts. Section AA′ on the plan and a photograph (PLATE IV) illustrate these points.

The lower half of the building (PLATE II) is massively constructed of boulders and stones,[2] the steep terminal slope showing a ' battered ' revetment wall, in one place of four courses. There is no lime mortar but clay may have been used ; the walls are about four feet thick. This lower half measures internally about 22 by 14 feet.

The upper half of the building is differently constructed. No effort seems to have been made to excavate to a vertical face in the hillside and so to build up an internal wall from the floor level ; instead, slabs of stone (orthostats) are sunk into the ground at the foot of the dug slope, mainly, it would appear, to hold up earth-slides, and then, higher up and further back, a revetment wall of small stones is built against the face of the excavation. At both angles and on the west flank this walling survives up to ground level ; in places four courses are visible. Orthostats are seen only on the flanks of the excavated area ; they are almost certainly present at the end of the structure, being hidden under earthy talus. These features are illustrated in the Plan, and Section BB′, where the orthostats are shown in black.

The above considerations make it probable that the length of the upper half of the building measured on the floor was not less than 20 feet. The breadth between the orthostats is only 12 feet, but at the

[1] And a stone-walled circular pit, identified as a 19th century rabbit-trap. *Inf.* Dr F. J. North.

[2] The whole of the stones used in the erection of the building were masses of old Red Sandstone (grits and sandstones) derived from the glacial deposits which flank the local hills and formerly filled the valleys. The solid rock of the site is Carboniferous Limestone. *Inf.* Dr F. J. North.

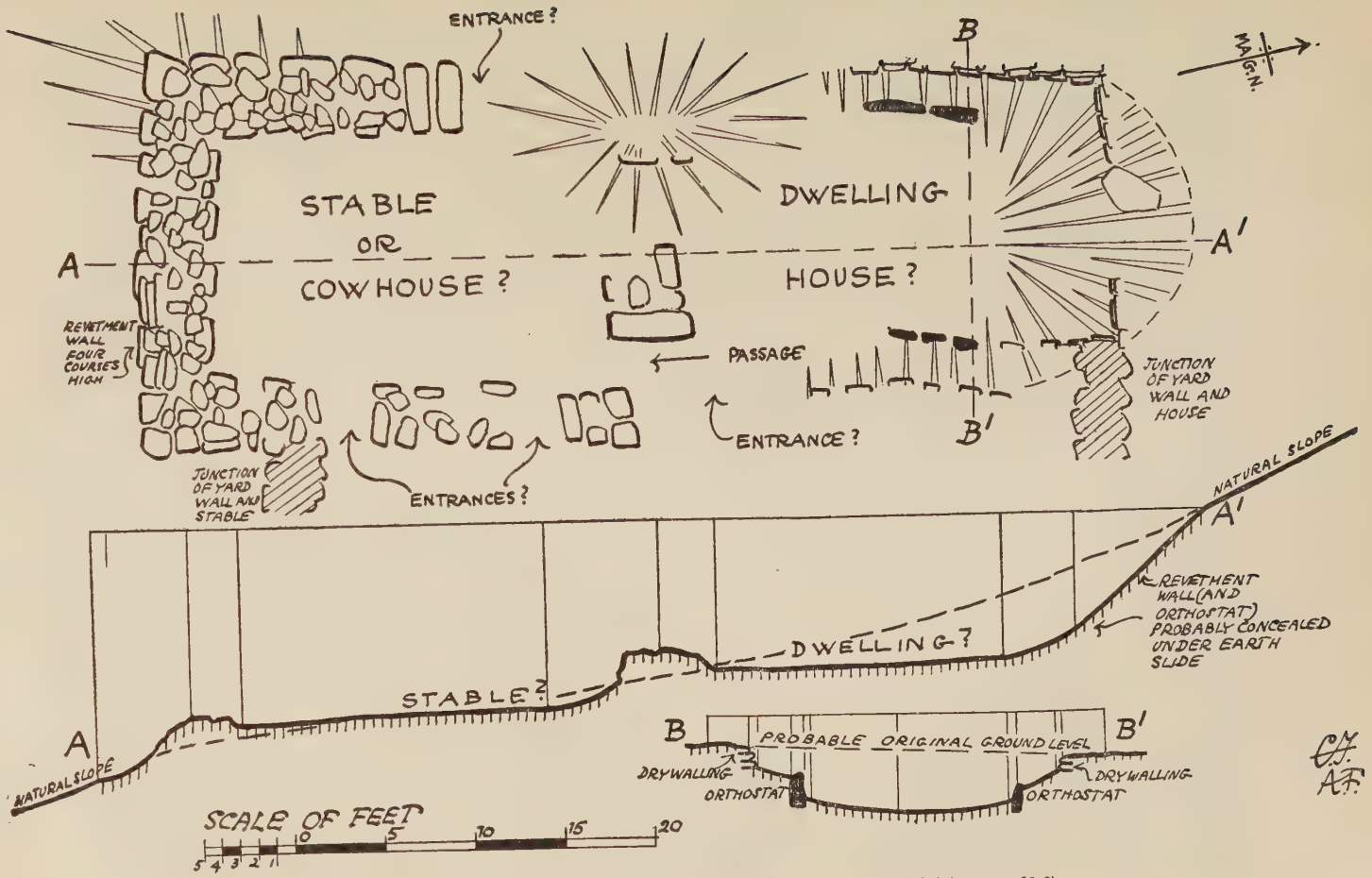

FIG. 3. SKETCH PLAN AND SECTIONS OF THE BUILDING, NANT-Y-MOCH (*see* pp. 366–8)

southern end near the cross-wall where external and internal levels coincide the breadth of the floor must be much greater, being the distance between the faces of the revetment walls, namely 17–18 feet. It follows that the *roof span* here was some figure in excess of 17–18 feet. Now since the breadth of the lower half of the house, measured to the external walls, is 21 feet, it is probable that the roof in both halves was similar in span ; that is, to outward appearance the building was unitary, a single rectangle, its roof-tree probably sloping downhill, to maintain approximately the same height above the ground throughout. Finally, we may estimate the total overall length of the structure as not less than 55 feet. Probable or possible entrances, only to be proven by excavation, are shown on the Plan : three in the lower half of the house and one in the upper.

The Type of the House Considered

The type of house represented at Nant-y-moch is not difficult to determine. A glance at the series of figures of Long-Houses in a recently published book—Mr Peate's *The Welsh House*,[3] foreshadowed by an article in ANTIQUITY 1936, pp. 448–479, esp. p. 453, shows that it belongs to that group. The essential features of the Long-House as described by Mr Peate are : a cowhouse under the same roof as, and in continuation of, the dwelling, usually at a lower level; direct communication between the two by means of a passage. The earlier dwellings (upper house, *pen uchaf*) are structurally single, the interior being partitioned off later as required for comfort or convenience. Many are single storied, but Long-Houses in which there is an original loft reached by ladder or staircase are known.

It seemed to me probable that the lower half of our house, *pen isaf*, was the cowhouse or stable, the upper, *pen uchaf*, the dwelling. The existence of the passage shown in the Plan is quite certain. The normal plan of a Long-House, moreover, which has a central hearth adjacent to the passage, suggested an explanation for the mound of rubbish, now grass-grown, on the west side of the cross-wall (see FIG. 3); it is likely to be the ruins of an (inserted ?) stone chimney stack. The houses of this class described by Mr Peate range from 36 feet upwards to 80 and 90 feet in length. He figures two of 55 and 57 feet respectively.

In pursuit of this analogy, I studied a group of Long-Houses in a district where they are still numerous, the beautiful and little-known

[3] *Y Cymmrodor*, XLVII, 65–66 and figs. 8–20 ; *Antiquity*, XIV, 445.

valley of the Cothi, Carmarthenshire.[4] I found the parallels even closer than I had anticipated, the placing of several houses in relation to the immediate environment being exactly comparable with Nant-y-moch. One sees the artificial platform deeply levelled into the hillside and the alignment of the structure at right angles to the contours.[5] One house showing these features, Pant-y-Bettws, in Llanfihangel-Rhos-y-Corn parish, was planned and photographed.

Pant-y-Bettws, situated 770 feet above sea level, is built of the local stone ; it is 70 feet in length, the ' upper ' and ' lower ' houses being exactly 35 feet each. Its general appearance is illustrated in PLATE I ; the sheep dog is standing by the door to the cow-stalls, the figure by the only entrance to the upper house (*pen uchaf*)—that opening into the feeding walk. The house has an original loft, the windows of which are seen under the galvanized iron roof which hides the original heather thatch : the great chimney crowning the cross-wall can just be seen. The steep rocky hillside into which the house nestles forms the background : the garden fronts the upper house. The photographer then walked into the cow stalls, while the visitor stepped up into the kitchen ; PLATE V was taken, and needs no further elucidation.

A plan, with longitudinal and cross sections, shows the characteristics of the structure more exactly. In the Plan, FIG. 4, original walling is shown in thick outline. The upper house is ' structurally single ' as Peate describes the type ; the wattled casing of the stairs to the loft is an interesting survival, due doubtless to the fact that the house has long been uninhabited. The great open fireplace is in the typical position. A recently-inserted fireplace at the other end is omitted from the plan. The feeding-walk is a passage entered at either end ; it was originally wider. The lower house, *pen isaf*, has been modernized[6] but preserves its ancient lay-out—feeding-walks, cow-stalls and calf boxes. The longitudinal Section, FIG. 4 (A–A′), shows how the house is built into the hillside, and illustrates the extent of excavation at the upper end and make-up at the lower.[7] The structural

[4] The assistance of my friends Captain and Mrs Joynson, of Brechfa, Carmarthenshire is gratefully acknowledged.

[5] The difficulties of dealing with stormwater in the case of houses of 50 to 80 feet in length, if they were to be sited parallel to the slope of a Welsh hillside, doubtless provide the primary reason for the custom. Sited end-on, the problem of surface water is manageable, and the length of the house immaterial.

[6] To comply with regulations governing milk-production.

[7] These levels are not exact, but represent a close approximation.

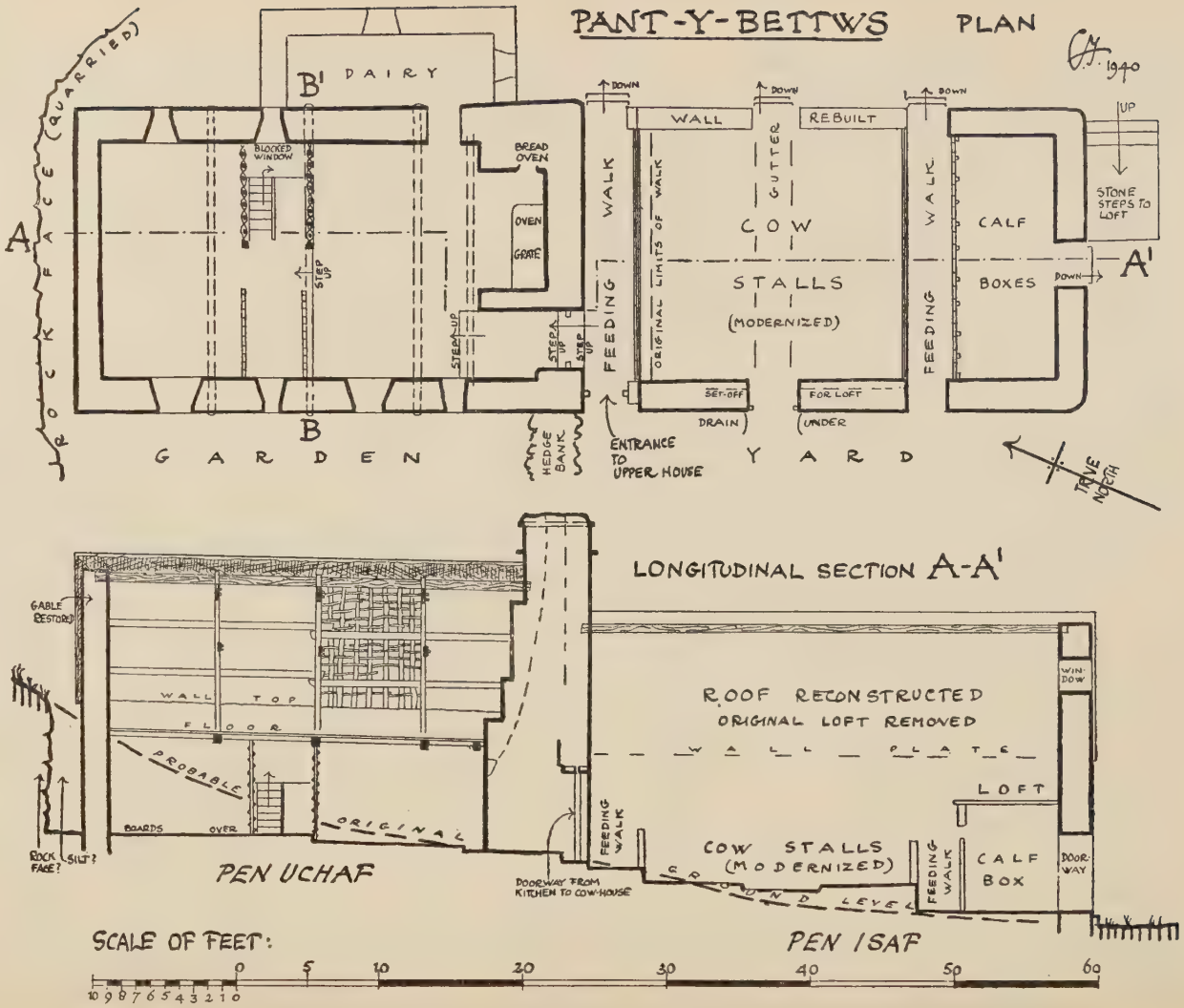

FIG. 4. PLAN AND LONGITUDINAL SECTION OF PANT-Y-BETTWS, A LONG-HOUSE IN LLANFIHANGEL-RHOS-Y-CORN PARISH, CARMARTHENSHIRE (*see* p. 369)

character of the loft is shown, the main trusses of the roof corresponding to the main beams of the loft floor. This floor is undivided and is lighted by 1 foot-square windows placed at floor level between the feet of the trusses.[8] This is more clearly brought out in the Cross Section (FIG. 5), which also shows the wattlework of the staircase ; the wattled

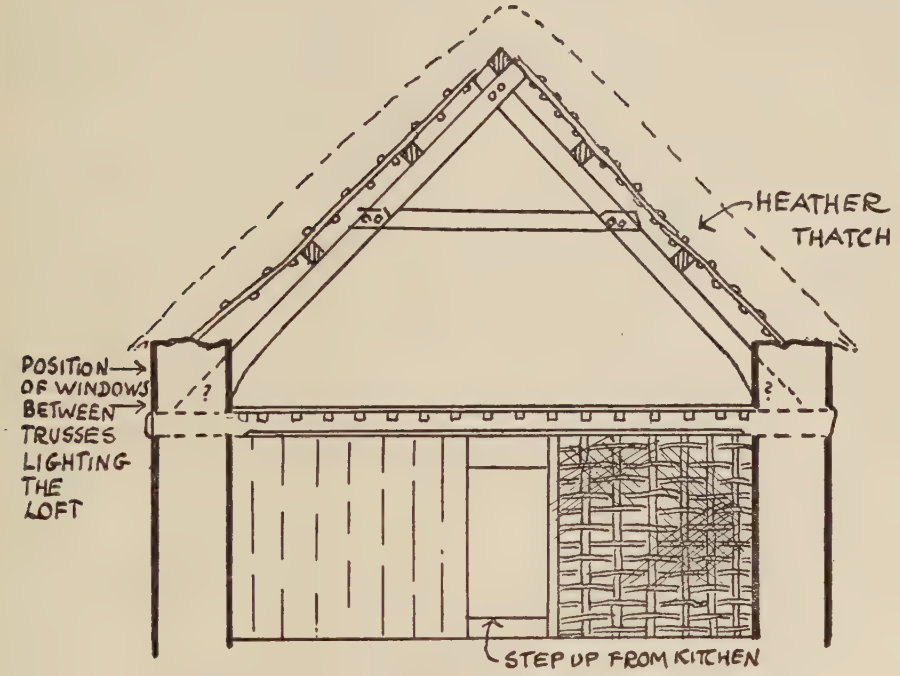

FIG. 5. PANT-Y-BETTWS: CROSS-SECTION OF UPPER HOUSE ON LINE B–B'; scale double that of Fig. 4

structure of the roof, replacing the common rafters of normal practice, appears in both sections.

A striking feature which I had not anticipated but which is not confined to this house, is the construction of the dwelling on the tilt. Wall-top, upper windows, floor-beams and ridge, all slope downwards. When in my first draft of this paper I wrote of Nant-y-moch ' its roof-tree probably sloped downhill ', I little thought I should be able to

[8] Probably pinned to the beams which go through the wall as suggested in FIG. 5 ; a most interesting constructional feature.

study a still-existing house on a similar site embodying so primitive a feature.

If the longitudinal section of Pant-y-Bettws be compared with that of Nant-y-moch, it will be seen that the correspondence is striking. In both cases the change from excavated area to raised platform corresponds with the division between the upper and lower houses and with the entrance to the upper house. Again, the position and height of the rock-face in the Pant-y-Bettws section shows that the floor of the upper end of the house is seven feet below the natural level, which corresponds closely with the estimated depth of this feature at Nant-y-moch.

But there is no doubt that significant as the parallels detailed above appear to be, the structure at Nant-y-moch is in some respects cruder than any existing Long-House described by Mr Peate or referred to in this paper.

In the Pant-y-Bettws Plan and Section the rock-face is shown clear of the gable wall, which thus stands free on its platform. Actually the narrow space between rock and wall is here filled up, but I am assured that the construction is as I have shown, that the silting up is due to the house being neglected, and that the space is, in inhabited houses of the type, carefully kept clear of rubbish to prevent damp.[9] At Nant-y-moch on the other hand, the excavation is, as we have seen, a burrowing into the hillside with the back wall a revetment, not a free-standing structure.

And there is a difference still more significant. At Nant-y-moch the excavation is horseshoe-shaped ; the upper end of the house was thus tucked into the hillside and was unlighted.[10] At Pant-y-Bettws *the excavation is extended on either flank of the house site*, especially on the entrance side facing SW where the main fenestration is, in order to provide adequate lighting and fresh air to the upper end. (The ' garden ' in the plan, then, is an excavated rock-floor). This is not exceptional ; I have seen the same technique at Caedwgan, in the same parish. It is an obvious and natural development, as the standard of comfort and convenience became gradually raised, and window-glass obtainable. I think then, that at Nant-y-moch we are dealing with a

[9] The section is restored from the evidence provided by Caedwgan, a similarly placed Long-House in the same parish.

[10] It might be thought that the rough boulder construction of the Lower House at Nant-y-moch would be another feature requiring notice in this connexion, but it is a matter of observation that such construction is of frequent occurrence in the Welsh uplands at almost any date.

structure of Long-House type which has elements typologically ancient and unrepresented in inhabited Long-Houses, and that we must look elsewhere for parallels to its primitive features. We need not look far ; for these features are to be found in the moorland platform houses described in ANTIQUITY in 1934,[11] five of which were subsequently excavated by my wife on Gelligaer mountain, Glamorgan. One example was dated by stratified finds as not later than the 14th century, and it was held that since the type, of which some 30 examples are now known, is not Saxon or Norman, its origin must be sought in Wales prior to the Norman Conquest.[12]

The deeply-excavated and horseshoe-shaped end, revetted with dry walling, is seen in the Lower House, Dinas Noddfa[13] and in the Centre and South Houses above Graig Spyddyd.[14] Moreover, evidence of human occupation in the shape of a refuse pit, a refuse trench, a fireplace, charcoal, and broken pottery, were in this series of Houses confined to the upper (excavated) end of the platform, as the Long-House analogy indicates was the case at Nant-y-moch. The Centre House at Graig Spyddyd, 1350 feet above sea level, which provided the evidence of medieval date for the series, is illustrated in this paper (FIG. 6) : it will be observed that the same contrast is seen in the character of the structure—revetment above, walls, in this case of turf, below—as at the Nant-y-moch croft. This house is comparable in size to that at Nant-y-moch (63 feet by 24 feet). I cannot show a section : but the slope-symbols on the Plan show the limits and character of the excavation into the hillside, and the ramp at the lower end.

But we must not jump to the conclusion that Nant-y-moch represents the same plane of development as Graig Spyddyd. The platform at Graig Spyddyd is on a single, not a double level as at Nant-y-moch. This double level is surely a significant modification ; it was undoubtedly determined by the difficulty of preparing a level site, large enough for both parts of the Croft, on a sloping surface, where the rock (the Carboniferous Limestone) dips towards the stream at an angle of about 8°, and the superficial deposits thin out rapidly in the same direction.

The double level may, therefore, have originated when cultural changes in Wales caused a movement of population and economic

[11] C. and A. Fox, *Forts and Farms on Margam Mountain, Glamorgan*, pp. 395–412.

[12] Aileen Fox in *Arch. Camb.*, 1937, pp. 247–268 ; 1939, pp. 163–199.

[13] *loc. cit.*, 1937, p. 251, fig. 2.

[14] *loc. cit.*, 1939, fig. 3, p. 167 and fig. 4, p. 168.

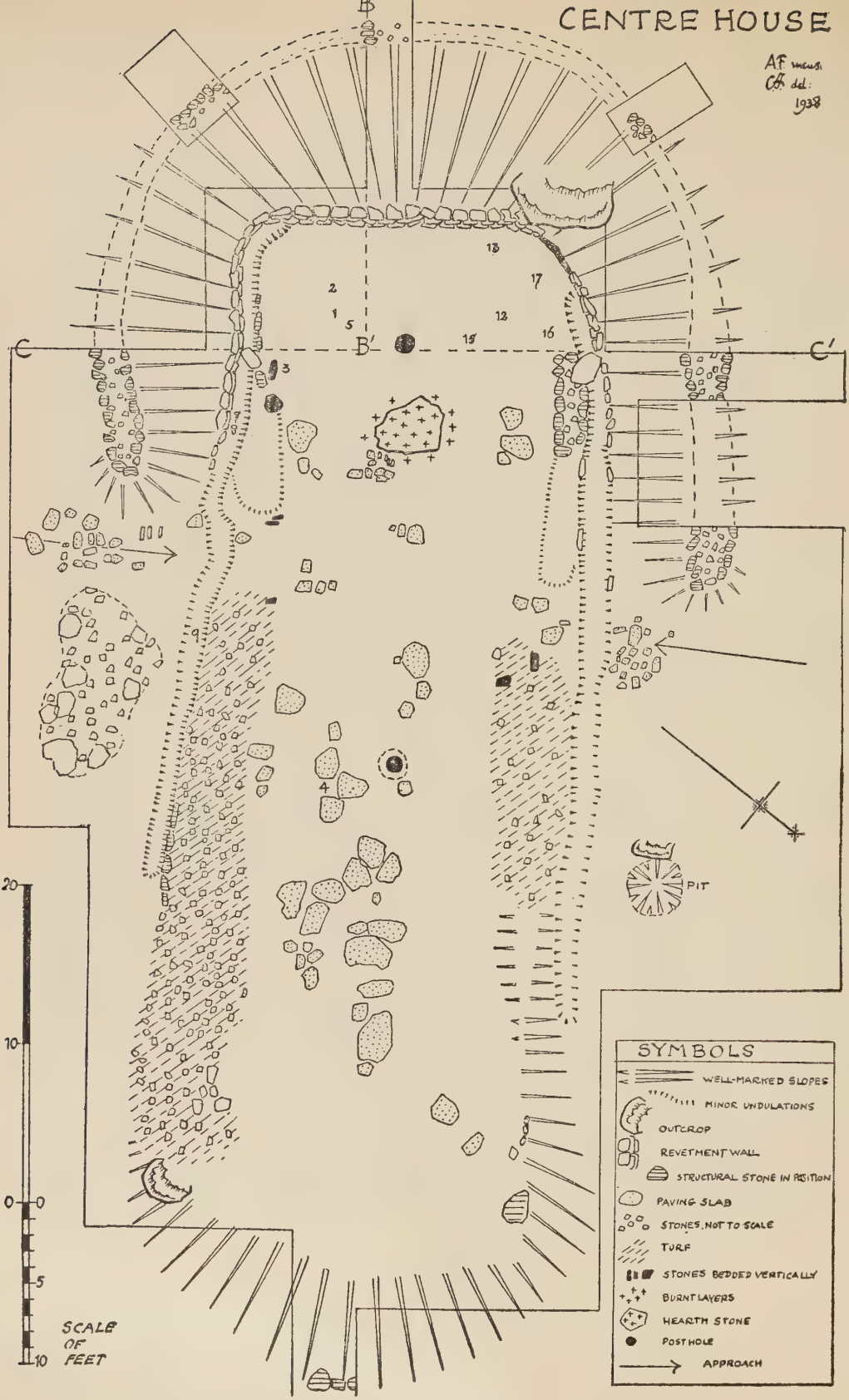

FIG. 6. THE 'CENTRE HOUSE', GRAIG SPYDDYD, GELLIGAER, GLAMORGAN (*see* pp. 373, 375)
After Aileen Fox, *Archaeologia Cambrensis*, 1939, fig. 3, p. 167. By courtesy of the Editor, *Arch. Camb.*

activity from exposed platform sites such as those occupied at Gelligaer, to sites lower down the valley sides, where slopes are generally steeper. The secondary advantage, the preventing of cow-house drainage from seeping into the living quarters, would at once have been recognized, and may have caused the system to be adopted even on sites where it was not a matter of necessity.[15]

For the convenience of the reader, the essential details of the three houses are tabulated below.

Name	Elevation	Character	Overall	Date
Centre House, Graig Spyddyd, Glamorganshire	1350 ft.	Single level platform at right angles to hill contours. Hearth at upper end. Horse-shoe-shaped excavation into hillside, hooded, with curved corners to revetment. Internal drainage channel. Turf walls at lower end of house.	63 by 24 ft.	Early 14th century
Nant-y-moch, Ystradfellte, Brecknockshire	1050 ft.	Double-level platform at right angles to hill contours. Cross wall dividing ' upper and lower houses '. Horse-shoe-shaped excavation into hillside, revetted rectangularly. Stone-walled lower house.	55 by 21 ft.	?
Inhabited Long-Houses, as represented by Pant-y-Bettws, Llanfihangel-Rhos-y-Corn, Carmarthenshire	770 ft.	Double platform (with subsidiary changes of level) at right angles to hill contours. Structure in two equal halves, dwelling (upper) and cow-house (lower). Broad excavation into hillside; the stone building stood free, windowed on both sides.	70 by 21 ft.	Early 17th century

To return to our comparison: the severely regular character of the revetment in the upper house at Nant-y-moch, so unsuited to a scooped-out hillside, would appear to be typologically later than, and has no parallel in any of, the houses at Gelligaer. The stone-cored embankment (hood) shown in the plan of the Centre House (see FIG. 6), also, is not represented at Nant-y-moch. And I should be surprised if

[15] These two paragraphs owe much to my colleague Dr North's interest in the problem.

the drainage channels flanking the latter house and partly inside the revetment, which served, in part, domestic uses, have any counterpart at Nant-y-moch.

Summing up the various aspects of the problem provided by the Nant-y-moch ruin, I suggest that it is probably a Long-House embodying early features not hitherto recognized as elements of the type; that these early features are comparable with, and explicable by reference to, the medieval moorland platform house as exemplified at Gelligaer; and that consequently, this platform house may prove to be the prototype or one of the prototypes, of the Long-House in Wales. More than that cannot at present be said, for the purpose and function of these Gelligaer houses is still unsolved, and they occur in pairs and triples which the Long-House proper does not. Nant-y-moch, then, is provisionally regarded here as the middle term of a typological sequence; that the sequence is likewise chronological is probable, but extensive overlaps are to be expected.

PANT-Y-BETTWS, A 17TH CENTURY LONG-HOUSE, FROM THE SOUTH DOORWAY TO THE COW STALLS (*PEN ISAF*) (*see* p. 369)

The figure is standing by the entrance to the dwelling (*pen uchaf*) and feeding-walk

Ph. National Museum of Wales

facing p. 376

THE NANT-Y-MOCH BUILDING: SHOWING ITS POSITION AT RIGHT ANGLES TO THE CONTOUR O

Ph. Na

PLATE III

THE NANT-Y-MOCH CROFT FROM THE SOUTH SIDE OF THE RAVINE (*see* p. 363)

Ph. Dr F. J. North

SIDE, AND THE BOULDER-CONSTRUCTION OF THE WALL OF THE LOWER HOUSE (*see* pp. 363, 366)
of Wales

PLATE IV

THE NANT-Y-MOCH BUILDING, LOOKING SOUTH, SHOWING THE TWO LEVELS (*see* p. 366)

PLATE V

PANT-Y-BETTWS : INTERIOR (*see* p. 369)
The kitchen from the cow stalls, looking across the feeding-walk and the half-closed entrance door (on left)
Ph. National Museum of Wales

A Geologist amongst the Cairns

(Notes on the value of cooperation)

by F. J. North

SHERLOCK HOLMES claimed to be able to recognize one hundred and forty different varieties of tobacco ash, but he could not have solved the Mystery of the Golden Pincenez had he not been able to examine the ash as it lay upon the floor of a professor's study.

Similarly, a geologist may be able to identify any number of rocks from fragments collected during the course of an archaeological excavation, but he will not be able to indicate the story which the rocks may have to tell, and most likely may not even realize that there *is* a story to look for, unless he can see the stones *in situ*, and study not only their lithological characters, but also their relation one to another and to the general assemblage of materials with which they are associated.

For example, I have recently received for examination, a collection of stone chips and soils made during the course of an excavation in South Wales, but it happens that the geology of the vicinity is such that the characteristics that would provide satisfactory answers to most of the questions put by the excavator, are dependent upon the field-relations and structures of the rocks rather than upon the properties that can be studied in small fragments of them ; and not having seen the country surrounding the site, or the stones in their original position, it will only be possible for me to give names to the rock-types that are represented, and not to discover what the rocks may have to say about the aims and methods of the builders of the cairn.

On the other hand, an examination of such material *in situ* has frequently proved to be highly instructive ; it has in some cases confirmed conclusions arrived at on archaeological grounds, or has served to explain such conclusions, whilst occasionally it has provided a story that purely archaeological enquiry could not have revealed, and always it broadens the basis of the investigation. It is the purpose of this paper,

therefore, by outlining the results of recent co-operative work, to emphasize the desirability for proper geological examination of sites in course of excavation—to remind archaeologists that geology provides them with a useful instrument of research, provided that the geologist recognizes the peculiar nature of the problems with which he will be called upon to deal.

This is by no means the first time that the value of a geological basis for archaeological investigation has been indicated: Sir Cyril Fox drew attention to it in his *Archaeology of the Cambridge Region* (1923), and the present writer has described some recent results of the application of geology in many kinds of archaeological problem.[1]

The importance of making a geological investigation upon the site and not merely a laboratory examination of material collected by an excavator was, however, recognized by geologists long before archaeologists began to act upon the principle involved.

Quite often, even today, one is asked to report upon a fragment of stone, accompanied by no other information than that it was obtained from an excavation on such and such a site; and yet as far back as 1696, John Woodward, who founded what subsequently became the Woodwardian Chair of Geology at Cambridge, prepared a pamphlet of *Brief Descriptions for making observations and collections, and for composing a travelling Register for all sorts of Fossils*—including under ' fossils ', as was the custom in his day, not only the objects to which that name is now applied, but also rocks and minerals, and anything else dug out of the earth, like stone implements and flint arrow-heads, which he regarded as having been made by men who lived before the discovery of iron, and compared with similar objects used by ' natives yet barbarous '!

The opening paragraph of this tract shows an astonishing appreciation of vital points, all too often neglected even in these enlightened days. It runs as follows :—

> 1. *Of Keeping a Register of the Fossils as they are collected.* By means of Paste, Starch, or some fit Gum ought to be fixed to each Sample collected, a bit of paper, with a *Number upon* it, beginning with No. 1, and proceeding to 2, 3 and so on . . . Then in the Register, enter Numbers answering to those fix'd on the Fossils, and under each Note, 1, *what sort* of Fossil or Mineral 'tis expected to be. 2. Where 'twas *found*. 3. Whether there were more of the same, and in what *Number or Quantity*. 4. Whether it was found on the *Surface* of the Earth.

[1] ' Geology for Archaeologists ', *Archaeological Journal*, 1938, XCIV, 83–115. ' The Background of History in North-eastern Wales ', *Archaeologia Cambrensis*, 1932, 1–47.

5. Or, if it lay deeper, notice at what *depth*. 6. In what *Posture* or *Manner* it lay. 7. *Amongst what* sort of terrestrial matter 'twas lodged. 8. Whether in a *Stratum* or Perpendicular Fissure.

A similar desire for details concerning the mode of occurrence of the material sent to him was expressed by William Buckland, Professor of Geology at Oxford, who first demonstrated the reality of the existence of ' antediluvian ' animals in Britain, largely upon the evidence of his discoveries (in 1821) in Kirkdale cave in Yorkshire, a subterranean chamber which he showed to have been used by hyaenas as a den.

When Miss Talbot, of Penrice in Gower, wrote telling him of the discovery of a new cave[2]—subsequently famous as Paviland Cave, once a home of Palaeolithic man—he immediately sent the following list of questions :—

1. Was the Bottom of it flat or inclined ?
2. What was its size—& how many fissures or side vaults had it in communication with its interior, and did any of them ascend to the surface ?
3. Is it in the Cliff or Inland & how discovered ?
4. What was the Position and Depth of the Mud ?
5. Are there any pebbles in it ? or anywhere fragments of rock ?
6. Was there a Crust or Stalagmite above the Mud & a 2nd crust below it dividing it from the Rock—or any Stalagmite investing the Bones ?

If you say the Bones were Broken, was this from Decay and time, or were they fragments the edges of which were old as if broken before the Mud had got near them, by Beasts inhabiting the Den ? . . . the moment I can stir I will if possible run down to get a peep at what remains in the Cave, for as yet I do not understand its history nor how the animals got there—meantime pray have the mouth *closed* up again to prevent total destruction.

For the sake of homogeneity the illustrations here given in support of my thesis will be confined to observations that it was my privilege to make in connexion with the excavation of two Bronze Age sites—one at Coity near Bridgend in South Wales, excavated by Sir Cyril Fox in 1937,[3] and one near Crick in Monmouthshire, excavated by Dr H. N. Savory in 1939.[4]

The first of these (which Fox called the Simondston Cairn from the name of the nearest farm) was a low circular mound that proved to be a cairn denuded, by agricultural processes, to the lowest layer of the

[2] Unpublished Buckland correspondence, deposited in the National Museum of Wales by Dr Mervyn H. Gordon.

[3] Cyril Fox, ' Two Bronze Age Cairns in South Wales . . . Bridgend ', *Archaeologia*, 1938, LXXXVII, 129–180.

[4] An account will be published in *Archaeologia Cambrensis*, December 1940.

stones of which it had been composed ; the cremation burials, primary and secondary, were however intact. The archaeological results of the excavation, which are both important and interesting, do not here concern us, but observations, made from time to time as the stones were exposed, soon indicated that geology could do more than merely provide names ' to be fixed to each sample collected '.

Five kinds of rock could be recognized—all of them native to the neighbourhood, but all different from the rock that floored the actual site on which the cairn had been erected. Each variety had been used for a particular purpose, and it was apparent that the builders were thoroughly familiar with the distribution and characteristics of the rocks in the square mile or so that lay to the east of the cairn.

The local superficial deposits included soil, and a subsoil with more or less rounded stones neither suitable nor present in sufficient abundance to be exploited for cairn-building. The rock-floor of the site belongs to the geological formation known as the Lower Lias, which here consists of alternations of limestone and shale.

The shale, being very fissile and brittle, and occurring in thin beds, was obviously of no use as a medium for building, but on the face of it the limestone might have been considered suitable, because, occurring in definite beds a few inches thick, and being intersected by vertical joints, it would have been quite easy to dislodge roughly rectangular blocks, large enough to be useful and small enough to be easily handled.

Indeed, in many parts of its outcrop the Liassic limestone has been used as a building stone throughout the historic period. It happens, however, that near Coity most of the limestone is highly argillaceous and incipiently fissile, so that although when freshly dug it is hard and massive, a comparatively short exposure to the weather reduces it to a mass of flaky rubble. This fact was evidently well known to the builders, since they made no attempt to use the rocks for the general fabric of the mound, although they did not trouble to remove from the site the few blocks that had to be shifted when certain small pits were dug.

Underlying the Liassic strata, and outcropping south and east of the site of the cairn, is the sandstone that constitutes the local representative of the Rhaetic Formation. This rock consists of rather large quartz grains, not very tightly held together by a siliceous cement ; consequently, although it resists exposure to the atmosphere and to the waters that are present in and under the soil, wind and abrasion tend to round off the corners of exposed masses.

The sandstone is affected by somewhat irregularly distributed bedding planes and by joint planes, so that blocks of varying size can be dislodged from weathered outcrops by means of simple levers and wedges. West of the cairn the sandstone is exposed in the floor of a small tributary of the Ogmore river, but the rock does not project above the general level of the soil, and although well-weathered masses could be picked from the surface, fresh material could only have been obtained by excavation ; about 250 yards away to the east, however, where the ground slopes towards a tributary of the Ewenny river, the denuded edges of the beds are well exposed and form miniature crags. It was from here that the mound-builders must have obtained the bulk of their material, for, with the exception of a score or so of relatively large masses and a few smaller pieces of other rocks used for special purposes, the stones—and there were hundreds of them—were sandstone blocks such as could have been obtained by a simple quarrying process from these exposures.

For the primary burials, a cist measuring 3 ft. 5 ins. by 2 ft. 9 ins. inside, had been constructed from large slabs of sandstone similar to that already described as having been used for the rest of the cairn. It thus transpires that the essential elements of the cairn—the walls and floor of the cist and the stones used to make the core of the mound—were all of one kind of rock, derived from one group of outcrops, situated east of the site.

Thus far the story revealed by the stones was quite straightforward; but on the southern margin of the cairn there were several relatively large blocks that were obviously supplementary to the simple cairn-cist combination. Some of these were of Rhaetic sandstone like that used for the remainder of the cairn, but others were quite different and included red and grey conglomerates derived from the Triassic Formation, and shelly limestone (different from the limestone under the site) from the Lower Lias. The red and grey conglomerates outcrop northwards and eastwards of the site, and from three to four furlongs from it, while the shelly limestone outcrops about three hundred yards to the southeast. Their distribution on the site is indicated in FIG. 1, which is based upon the plan made by Sir Cyril Fox and relates to about two-thirds of the cairn. The remainder of the plan has been omitted in order to save space, because only one type of rock (sandstone) was present and no special structures were represented in the area to which it relates.

The general nature of the groups marked I to V is indicated in one

of the sections in FIG. 1 : there was a large thick slab (in one case two slabs) leaning against smaller and usually thinner ones, which in turn rested against a face of undisturbed clay into which small stones had been pushed as if by way of reinforcement. ' Each group ', wrote

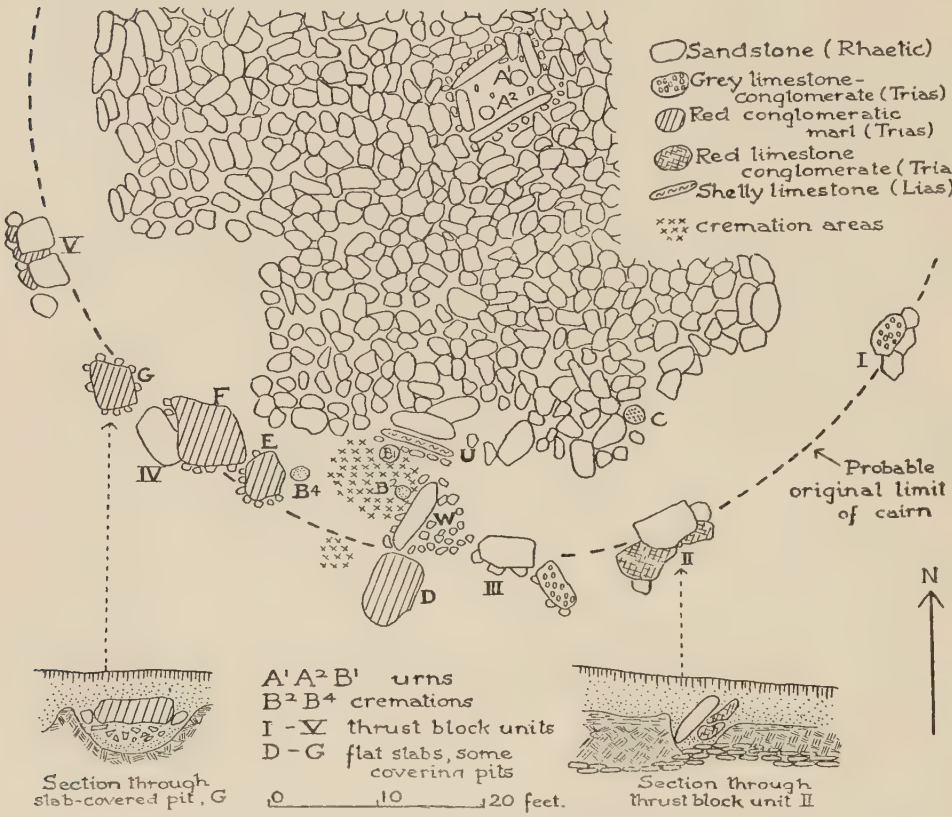

FIG. 1. PLAN OF PART OF SIMONDSTON CAIRN, NEAR BRIDGEND, EXTRACTED FROM DRAWINGS MADE BY SIR CYRIL FOX AND PUBLISHED IN *ARCHAEOLOGIA*, VOL. 87 (1938), PLATES 49 AND 50

Fox, ' represents . . . a *thrust block* or bedded buttress in which the initial pressure was taken by the surface of the carefully chosen upper slab and was extended outwards by the slabs . . . below ; each thrust block played its part in rendering the cairn stable '.

The primary elements in these ' buttresses ' were blocks of Rhaetic sandstone, comparable in size to the smaller elements of the cist walls,

and in some cases the same rock had provided the material for the packing stones, but in nos. I, II and V *pieces of grey or red Triassic conglomerate were used*. In the case of no. I, where the primary element seemed to be missing, the topmost stone was a slab of grey Triassic limestone conglomerate.

The lowest layers of several of the thrust block groups included masses of Liassic limestone, derived from a nodular bed disturbed during the excavation of the holes made to receive the blocks. This rock is more durable than the evenly bedded limestone that predominates on the site, and which, as already indicated, does not stand up to weathering. In one case nodular limestone alone was used for the packing blocks.

Other large blocks, e.g. D, E, F, and G, lay more or less flat and either on or a little below the level of the ground. They were of red conglomeratic marl derived from the Trias, and two of them, E and G, were found to cover holes that had been dug and refilled with loamy earth and small stones (see FIG. I). In the earth there were flecks of charcoal, and in one case (E) a sliver of burnt bone. Beneath the slab F there was a layer of similar loamy earth with fragments of charcoal, not filling a hole but resting on undisturbed clay. The slab D was separated from the clay by two or three inches of soil without artifacts, and seemed to serve no useful purpose at all.

The third group of stones in this region comprised a large mass of Rhaetic sandstone (W) and a mass of shelly Lias limestone (U) each of which had originally been placed upright, although each had since assumed a tilted position. They were associated with an area that had been disturbed in connexion with some secondary burials, and seem to have been placed with a view to protecting the area against the thrust of the mass of the cairn.

The foregoing notes concerning these special features along the southern margin of the cairn do less than justice to the skill displayed in exposing and explaining the stones, for, weathered and soil-stained as they were on the site, the differences were by no means as obvious as are the symbols by which the various rocks are indicated in FIG. I. Any practical results that the geological observations may have had are entirely due to the way in which the mutual relations of the stones had been preserved, although in the early stages of the excavation the temptation to shift many of them as being without significance must have been very great.

The general conclusions arrived at on archaeological grounds were

that the date of the primary burials, 'judging from the pottery, is probably Middle Bronze Age A, about 1500 B.C.' and 'at a later date in Middle Bronze Age A the southern margin of the cairn was used as a cemetery for a folk who cremated their dead'.[5] It was also assumed that the buttresses were part of the original scheme and that the slab-covered holes were associated with the secondary cremation burials. Archaeologically speaking these were obvious and perfectly reasonable conclusions, but subsequent re-examination of the geological evidence (during the preparation of the present paper) prompts an alternative suggestion based upon the following considerations :—

I. For the main mass of the cairn and its primary cist the rock used was the Rhaetic sandstone : this rock was also used for the principal stones in the thrust blocks.

II. Large slabs of grey and pink conglomeratic limestone and marl of Triassic age were used to cover something placed on the ground or in pits for some special purpose. These stones were brought from a greater distance than the Rhaetic sandstone, were of distinctive appearance, and evidently had special significance.

III. For supporting some of the thrust blocks the builders used flat pieces of the grey and red Triassic rocks. These were fragments such as might have broken away from the larger slabs already mentioned, during or after their removal to the site, since the conglomerates are affected by irregular curving planes of weakness, between the major and rather widely separated bedding planes.

IV. It seems unlikely that the smaller pieces of Trias would have been specially brought from exposures half a mile away for the purpose of packing some of the thrust blocks, when masses of sandstone, or of nodular limestone, were already available for the purpose ; and their presence in such situations suggests that the erection of the thrust blocks and the introduction of the larger Trias slabs were contemporary events. The sandstone elements of the thrust blocks could have been picked from the stones around the margin of the cairn as originally erected, for several of the marginal stones (especially in the region where there are no thrust blocks) are as big as those used as thrust blocks.

V. It is hardly likely that, with so gently sloping a site (about 2°), those who conceived the cairn would have realized the necessity for introducing buttresses, but one of the following alternatives seems feasible :—

(*a*) The southern margin of the cairn began to move soon after erection, and the thrust blocks were constructed : this operation was associated with some ceremonial activity involving the use of special and distinctive stones—the large flat slabs of Triassic conglomerate.

(*b*) Some ceremonial activity, after the mound had been completed, involved the digging of small pits and the introduction of special and distinctive stones : this revealed (or led to) instability of the margin, to cope with which the thrust blocks were introduced.

VI. If either of these interpretations is correct the secondary burials were incorporated into the mound *later* than the thrust blocks and the slab-covered pits.

VII. Granting this, the anomalous positions of the sandstone block W and the Trias block D can be explained by supposing that, ignorant of the structural features of

[5] Fox, *ibid.*, p. 141.

the cairn, the ' cemetery people ' dug into it and disturbed one of the thrust blocks and one of the Triassic slabs. The latter was displaced southwards, and became the block D, which, as we have already seen, appeared to serve no useful purpose where it lay ; while the stone W may be interpreted as the principal element of a thrust block (originally between Nos. III and IV) utilised in order to assist in protecting the new burial area; the group of smaller stones on the side of it remote from the burial area, a group for which there is no parallel elsewhere on the site, may in these circumstances be regarded as the packing stones originally associated with the slab D (and comparable to those still *in situ* under the slabs E, F, and G) used to increase the stability of W in its new position.

VIII. For the protection of the burial area another large flat stone was needed in addition to W, and a slab (U on the plan) of shelly Lias Limestone—not otherwise represented on the site—was used. The nearest place where (at the present time) such a rock is obvious and easily obtained, is in a small hollow southeast of the cairn, where rises a spring that feeds the stream which flows through Nant Bryn-glâs to join the Ewenny. Perhaps the ' cemetery people ' lived near this spring.

It is recognized that these suggestions are based solely on the relations between the various kinds of stone upon the site, and when I discussed them with Sir Cyril Fox (since they were conceived long after the preparation of the geological notes supplied for his Simondston paper) he pointed out that although they offer a very acceptable explanation for the relatively disordered condition of the stones in the region between the thrust blocks III and IV, they raise difficulties of their own.

For example, the fact that small quantities of charcoal were found under the Trias slabs, and a sliver of burnt bone under one of them, shows that cremations had taken place before the placing of the slabs, and since charcoal was absent from the site generally (very little being found even in the cist, and the urns of the primary burial) it can be argued that the charcoal under the slabs was more likely to have been associated with the secondary cremations than to have been already present in the fabric of the mound when the residues of these cremations were buried. The only way in which this objection can be met is by assuming that such charcoal as may have been dropped by the primary burial people was present only in the superficial layers of the mound, and that its general absence is due to the fact that those superficial layers have been almost entirely lost as a result of agricultural operations. Some of the superficial material may, however, have survived near the periphery, where the surface of the mound merged into the ground level and where subsequently the Trias slabs were placed.

Another difficulty arises from the fact that the Triassic slab F rests partly upon one of the thrust blocks : although (taken in association with the use of fragments of similar Triassic rock as packing material under the sandstone blocks constituting the principal elements of other

thrust blocks), this implies that the two kinds of rock were being used at the same time, the skill displayed in planning and erecting the thrust blocks is not consistent with the disregard of them displayed by the placing of the slab F. At present the only reply I can give to this objection is one that rather begs the question, and suggests that, granting the difficulty in explaining why, having made a thrust block, the Simondston people partly covered it by a slab associated with some observance that involved making small pits and covering them with large flat stones, it is even more difficult to imagine that a people who used one kind of rock only (sandstone) for the mound, the primary cist, and the principal elements of the thrust blocks, should have gone half a mile away for a few pieces of a different rock to put under some of the thrust blocks, when hundreds of suitable pieces of sandstone, and a quantity of the nodular limestone which was disturbed in preparing the sites for the blocks, were already to hand.

These two difficulties apart, the geological explanation of the disposal of the stones around the southern margin of the cairn, does not, I am assured, involve archaeological improbabilities. That they can be put forward at all shows that the study of such a site need not end with the completion of the excavation and the publication of the report.

The modern technique of cairn excavation usually involves complete or almost complete destruction of the fabric and the disturbance of every conspicuous stone, and the record of the work might easily become a completed and unalterable statement. When, however, as in this case, every item of evidence is impartially recorded, in sketch or in words, whether it appears important or not, whether it is essential for the current interpretation of the excavation or not, and even if it appears at the time to be quite adventitious, then research need not come to an end when the last sod of turf has been replaced, and the last proof of the report returned to the printer.

A problem may be re-considered in the light of new discoveries elsewhere, or some special feature may be separately studied more closely than is possible under conditions that obtain during the course of an extensive excavation, when fresh facts are being revealed with bewildering frequency and the physical conditions are by no means helpful.

Apart from the light which geological investigation threw upon the methods and local knowledge of the Simondston mound-builders and their immediate successors, it also ' provided the first approach to proof of a visual relation between settlement and burial places in the Bronze

Age, a relation which is often assumed to exist, without proof '.[6] This conclusion was arrived at because the situation of the mound, upon the crest of a saddle, was such that it ' was visible for a considerable distance from the east side, but only from a short distance on the west side ', and it was from the east—from a region drained by a small tributary of the Ewenny river and eminently suitable for settlement—that the builders derived all their stony material.

Another site in which the stones had a story to tell was excavated in 1939 by Dr H. N. Savory. It was a Middle Bronze Age barrow situated near Crick in Monmouthshire, and from an archaeological point of view was somewhat disappointing, for it yielded no spectacular finds and presented no striking features in its construction.

All the earthy material of the mound was derived from the immediate vicinity, and was a mixture of the local soil and the subsoil to a depth from 15 to 18 inches beneath the surface. The massive elements of the cairn were confined to a simple peripheral ring of stones (FIG. 2), varying in size from boulders nearly six feet across down to mere flakes no larger than the palm of one's hand.

At a first glance the ring seemed almost not to be worth studying, so mixed were its constituents and so indifferently was it made, but when the stones were examined individually it soon became apparent that the nine rock-types that could be recognized were distributed in a peculiar manner, and the lithological identity of every one of them—about 350—was determined.

Fortunately it happened that the rocks were of kinds that could be readily identified after macroscopic examination, for weathering had accentuated the differences between them, instead of, as is often the case, causing widely differing types of rock to acquire weathered crusts of closely similar appearance.

The most conspicuous stones were some large boulders, 33 in number, and varying from two to nearly six feet across, placed at irregular intervals around the ring. They consisted of fine quartzites, poorly cemented sandstones, and conglomeratic grits, all obviously derived from the same geological formation. They all had smooth well-worn surfaces, and proved to be glacially transported erratics derived either from the Old Red Sandstone or the Carboniferous Series. Owing to lack of facilities for field work since the excavation

[6] Fox, *ibid.*, p. 141.

was undertaken it has not been possible to determine which, although the available evidence points to the older formation as the parent rock.

FIG. 2. PLAN OF THE STONE RING OF CRICK BARROW, MONMOUTHSHIRE, BASED UPON DRAWINGS MADE BY DR H. N. SAVORY, TO BE PUBLISHED IN *ARCHAEOLOGIA CAMBRENSIS*, 1940; WITH LINES TO SHOW THE RELATION OF THE STONES TO A TRUE CIRCLE AND INDICATIONS OF THE KINDS OF ROCK PREDOMINATING IN THE VARIOUS PARTS OF THE RING

Between these large boulders, which we may for convenience refer to as ' key ' boulders, there were other stones of which the largest (very

few in number) were about as large as the smallest of the key-boulders, although the majority were considerably smaller, and many were little larger than the ' hand-specimens ' one would collect for a museum cabinet.

This series of stones, filling the gaps between the ' key ' boulders, included grits and sandstones similar in nature and in origin to the rocks of those ' key ' boulders, as well as some grey felspathic grits, but the majority were limestones of Carboniferous and Triassic age. The former included four recognizable varieties :—Oolitic limestone, coral-bearing limestone, thinly-bedded earthy limestone without fossils (all greyish in tint), and buff coloured crystalline dolomitic limestone, whilst the rock of Triassic age was a compact sparry limestone of pale pinkish tint.

The rocks themselves were of no particular interest, and the workmanship displayed in their incorporation into the ring was of a very low order, but their *distribution* was obviously significant. In the east-north-eastern sector of the ring the only rock represented (apart from three or four small pieces of sandstone) was the Triassic limestone, but passing round in a clockwise direction one found that in the eastern sector Triassic and Carboniferous (dolomitic) limestones were about equally abundant ; in the southeast the dolomite predominated, with a few scattered blocks of Trias ; in the southwestern and western sectors almost the whole of the rocks were the normal varieties of Carboniferous Limestone, although an occasional block of dolomite or Trias made its appearance ; finally, in the northwestern and northern sectors, the stones between the 'key' boulders included representatives of all the kinds present in other parts of the ring—sandstones and grits like the ' key ' boulders, as well as the various kinds of limestone and dolomite, placed indiscriminately both as regards type and size.

The significance of this serial distribution of the smaller stones—Triassic limestone, Carboniferous (dolomitic) Limestone, varieties of normal Carboniferous Limestone, and finally a heterogeneous assemblage —became at once apparent when the local field relations of the Carboniferous and Triassic rocks were taken into account.

A small rocky boss protruding through the superficial deposits a few yards eastwards of the site, and cut through during the construction of the new modern road, shows the relationship which exists between them. The Trias here rests unconformably upon an irregular surface of Carboniferous Limestone, and is essentially a shore or beach deposit formed by the destruction and re-deposition of the older rock at a time

when the land was sinking after a long period of emergence and denudation. The uppermost layers of the Carboniferous Limestone are dolomitic, (i.e. consist of the carbonates of calcium and magnesium, instead of calcium only, as in normal limestone), so that the section shows, in descending sequence :—Triassic limestone, variable in thickness up to a maximum of six feet ; dolomitic limestone, variable in thickness up to a maximum of four feet ; oolitic and well-bedded normal limestones.

This relationship between the rocks as they naturally occur, taken in association with the distribution of the smaller stones in the ring, throws light upon the methods adopted by the builders of the cairn, while the ' key ' boulders suggest a reason for their choice of site.

A scattering, over a comparatively small area, of large boulders of sandstone and conglomerate would seem to have been the prime factor in determining the choice of site, for the boulders would have been the most conspicuous features in a comparatively level area. There is no local development of ' boulder clay ', for the superficial deposits underlying the soil near the cairn are either clay or fine sand entirely without large stones. The boulders would have lain on the surface, more or less completely exposed, and although we cannot here discuss the geological aspects of their origin, it is more than likely that floating ice (at a time when the general level of the land was lower than it is now) was the medium responsible for the last stage of their transport.

They would have been scattered over a limited area, and the first task would have been to gather them together and use them for defining the extent of the stone ring. Work would seem to have commenced at the end of the northeastern sector, and to have been carried on clockwise, but most of the really large stones had been used up by the time the builders had completed the northwestern sector, so that in the last part of the ring groups of smaller stones were used as 'key' boulders instead of single large ones.

There still remained a number of much smaller masses of sandstone, but they were quite insufficient to fill in the space between the ' key ' boulders, and they seem, for the time, to have been disregarded, while attention was given to a nearby hillock where rock protruded from beneath the soil. The structural features of the exposed rock—the littoral Triassic limestone—were such that fairly large masses could easily be prised away from the surface, and, again beginning at the end of the northeastern sector and working clockwise, the excavated or quarried material was used to fill the gaps in the ring. In a short time the Triassic limestone of the hillock gave place to the Carboniferous

(dolomitic) Limestone beneath, and while, for a time, both types of rock were carried away together, the dolomite was soon fully exposed, and it alone provided the smaller stones for about one third of the ring.

When the dolomite layers had been removed, the normal Carboniferous Limestone beneath supplied the material for the next third (southwestern and western sectors) of the ring, together with an occasional block of Trias or of dolomite, perhaps dislodged as it became necessary to enlarge the area of excavation.

When rather more than three-quarters of the ring had been filled in the supply of limestone seems to have run out, probably because the builders had quarried away the boss upon which they were working, or had reached the less weathered material that was more difficult to remove. To complete their work they used, indiscriminately, fragments of all the types of rock that they had previously used with greater selectivity. This sector includes a number of fragments of sandstone and grey grit similar to, but much smaller than, those represented in the 'key' boulders—further proof that the builders were hard up for material and had to scour the site for stones that they had previously ignored.

The suggestion that the preliminary laying out of the ring and the subsequent filling in were each commenced in the northeast, and that the work was carried out in a clockwise direction, arises naturally from the sequence of rock-types around the ring, and the assemblage of odd fragments in the sector where there was already a deficiency of ' key ' boulders ; also, as FIG. 2 illustrates, the line of stones approximates to a true circle in the northeastern and eastern regions, but departs markedly from such a figure as it is traced towards the northwest.

Comparing and contrasting the results of the geological investigation of these two cairns, we have, on the one hand, a picture of people familiar with the rocks of the district in which they lived, and sufficiently keen to look for the best spots in the locality for the stones they needed for their cairn. They chose their site with a view to securing a skyline position in relation to their homes, and brought to it rocks suitable for their purpose. Then, when additions were made, new kinds of rocks of distinctive type for special purposes were transported over distances ranging up to half a mile.

On the other hand, we have people content to make use of (or, it may have been, were reduced to the necessity of using) a group of large boulders which happened to lie upon the ground. The choice of site was dictated by the location of the boulders, but there were sufficient

only to give an incomplete outline of a ring, and masses of rock easily dislodged from a nearby weathered outcrop were pressed into service; the supply from this source was, however, insufficient to complete the packing of the spaces between the larger boulders, and for the last part of the ring the site was scoured for fragments that had been dropped or discarded during earlier stages in the work. There was not even stone to spare to line a cist, and no attempt was made to obtain further supplies from exposures that were no farther away from the site than the sources of supply drawn upon by the Simondston people were from the cairn at Coity.

The geological examination of these two Bronze Age burial-sites shows quite clearly that although the *identification* of the various types of stone in each of the cairns was an essential part of the investigation, the armchair identification of the chips, by some one who had not collected them, would not have led to the results outlined in these pages. To obtain such results, the mutual relation of the rock-types as they are distributed upon the site must be closely examined, *for the absence of any particular kind of rock from one part of the site may be of as much significance as its presence in another.*

In addition to general problems such as those already outlined, geology may also throw light upon matters of *detail* that arise during the course of excavation, and may encounter problems that have to be solved in the workroom. Two illustrations, both relating to the Simondston Cairn, will suffice.

Within the cist, and associated with one of the primary burials, was a small hemispherical cup about 45 mm. in diameter, but 'being a natural object, its importance was not recognized at the time'.[7] Acting on the sound principle that all such objects, whether apparently important or not, should be preserved for further examination, the specimen was handed to me with various other 'finds' that I had not seen *in situ.*

It proved to be the weathered crust of a nodule of marcasite (sulphide of iron), which could only have been derived from the Chalk, the nearest outcrops of which are more than fifty miles away from Coity. It was certain that the object could only have come into the district and into the cist as a result of human intervention, for it was far too fragile to have survived transport by glacial or alluvial action, even if these could have been considered as likely agents, and the question arose, was it another instance of the collection of minerals and fossils by early

[7] Fox, *ibid.*, p. 132.

man, i.e. was it part of a nodule that had decomposed within the cist, or was it already a cup-like object of some special significance when it was placed near one of the urns ?

The ' cup ' had been produced from an almost spherical nodule of marcasite in the following stages : the nodule was formed as a result of chemical action and the segregation of iron-bearing minerals within the chalk, and a crust of limonite (hydrated oxide of iron) was developed by oxidation of its surface layers ; this crust was sufficiently durable for half of it at least to remain intact while the remainder of the marcasite fell away, or was destroyed by subsequent decomposition, after the nodule had been removed from the chalk by weathering or by excavation.

From the regular character of the interior of the specimen, and the absence of decomposition-products in the adjacent clay, it was apparent that the development of the cup-like character was completed before the object was buried in the cist. It may or may not be significant that, of the individuals represented by the bones in the urn in association with which the cup was found, one was a juvenile, ' still in possession of the deciduous or milk teeth '.[8] The ' cup ' may have been a treasured toy !

As was usual in such circumstances, a good deal of charcoal was found in association with the various burials in the cairn, but the discovery of some fragments of coal in the material associated with the secondary cremations provided a new problem, since there had been no previous record of coal being used for such a purpose in Wales. It was necessary first of all to ensure that the pieces of coal (in fragments up to about three-eighths of an inch cube) had not fallen in from above during the excavation, because it is by no means unusual for such fragments to occur in the soil in the southern part of Glamorgan, having been dropped from farm carts that at some time or other had been used for the transport of coal, either for lime-burning or for domestic use. Close examination, however, proved, in this case, that the coal did actually occur in association with burnt and comminuted bones, charcoal, and burnt clay, in a layer of dark-coloured material underlying one of the urns.

Even this was not necessarily evidence that coal had been used as well as charcoal, as a *fuel* in the cremation, for the fragments were of unburnt coal, and it was necessary to demonstrate the presence of coke or charred coal in the burnt débris. Careful search revealed a few minute pieces of coke, but most of the black material was too fine in grain to be picked out by hand, and the following means was

[8] Fox, *ibid.*, p. 170.

adopted to ascertain if this finely divided material included both charcoal and coke. It is an adaptation of a method used in petrographical research for the separation of minerals of varying specific gravities, and in the present case was based upon the knowledge that charcoal is relatively lighter than coke and both of them lighter than clay.

About half an ounce of the material from the dark layer beneath the urn was dried by exposure to the air and lightly pounded in a mortar ; this caused a considerable part of it to fall to powder, which was placed in a porcelain dish and well covered with benzine. The whole of the solid material, being heavier than the liquid, remained on the bottom of the dish.

Bromoform (a heavy liquid, nearly three times as heavy as water and freely miscible with benzine) was then poured drop by drop into the dish. A point was soon reached when the specific gravity of the liquid became such that the lightest material (small black particles) in the solid mixture began to float. At first it came up in some abundance, and then, with the addition of more bromoform, more slowly. At this stage, the floating material was carefully scraped together, washed with benzine on a filter paper supported in a funnel, and carefully dried. More bromoform was then added and further material (also black) began to float up, until at last all the carbonaceous matter had been separated from the clay, which remained at the bottom of the dish. This second batch of black material, which was of slightly higher specific gravity than the first, was also skimmed off, washed, and dried.

Some material from each batch was then mounted for examination under the microscope and compared with the débris of visible charcoal and coke fragments that had been picked from the clay with tweezers, crushed, and similarly mounted. It was then seen that the first material to float had the fibrous texture of charcoal, while the second had the vesicular texture of coke. In this way what seemed to be an attractive possibility became an instructive certainty.

These examples are, I think, sufficient to indicate the possibilities of geological co-operation in archaeological work, and although Bronze Age Cairns were chosen to provide the illustrations, the same principles may be applied in the case of other kinds of excavation, and there are many other laboratory methods that can be (and have been) pressed into service, to supplement the results of the field work. But the work must begin in the field, for, as Polybius said in the second century B.C., ' the eyes are altogether more accurate witnesses than the ears '.

Old English Dead-fall Traps

by James Hornell

An immense amount of effort has been lavished by ethnologists upon studies of the customs and appliances of wild tribes in far-away lands, whereas by comparison those of their own grandfathers have been woefully neglected save by the few enthusiastic individuals interested in so-called ' bygones '. Fortunately the tide has turned at the eleventh hour and numerous local museums have now realized the urgent need to save a record of articles recently discarded from use in the everyday life of town and countryside. Under the name of ' Folk Museums ' a considerable number devote the whole of their space to the exhibition of collections illustrative of local life in the times immediately preceding the day of the existing generation. Such collections properly planned should be in continuous growth ; the things in ordinary use in the homes of today will be the bygones of tomorrow ; if continued without break these collections would become the authentic and wholly trustworthy record of the everyday habits of the mass of our people, beginning roughly with the opening years of the nineteenth century, thence progressing ' Cavalcade-fashion ' through the changing life of the generations following. Unfortunately the great majority appear to aim at the formation of a collection limited to the artifacts of a period that begins vaguely towards the end of the eighteenth century and ends still more vaguely sometime before the time of the present generation. Instead of being ' Folk Museums ' they are really ' Period Museums '.

One subject of record should be, and often is, that concerned with the abandoned methods, many of them exceedingly ingenious and employed till recently to trap and snare vermin, birds and fishes. Foremost among these were certain dead-fall traps used to catch rats and mice. The present note is an endeavour to trace the source of their origin and to study the variations found within one outstanding group of these traps, and their peculiar regional distribution in the British Isles.

With one exception no specific name seems to have survived for this kind of trap; in the districts where it was formerly in common use, it was just an ordinary ' rat-trap '. The one exception occurs in Cambridge where I am told that it was generally known as the ' Norfolk rat-trap ', the idea being that its use had originated in Norfolk, spreading thence to Cambridge.

It belongs to the dead-fall class; the principle involved is the vertical fall of a heavy weight intended to crush and kill the incautious victim. I propose to term it the ' vertical dead-fall trap '.

Before it was superseded by poison, ' virus ' and the cruel spring jaw-trap, its use ranged over a wide area covering the greater part of England. Although the main feature of the device was the same everywhere, early in the investigation it became clear that there were two distinct types with a few minor variations in each; these may either be local or, as is more usual, the result of the personal fancy of the individual maker.

The two types may be termed respectively the lever-arm type and the string-release type. The former is much the more common; generally it is of larger and heavier construction than the string-release type which, because of its small size, is definitely intended to destroy smaller animals than the larger type—the smaller is intended particularly for mice, the larger for rats.

Lever-arm traps (figs. 1–4) are much more frequently found in collections than the string-release ones; we are, I consider, justified in believing that the former represent the older and original type. In the usual and typical form the lever-arm trap consists essentially of a trough-like base, the ' box ' (*a*) open at the ends, a scaffold or gallows of two uprights, the guides (*b*), connected above by a cross-bar (*c*), of a massive rectangular wooden block (*d*) running on the guides which pass through holes bored vertically through it. It is further steadied by a centrally placed vertical pillar (*e*) having its foot let into the block, while its upper end passes through an aperture at mid-length in the cross-bar of the scaffold. The operating mechanism is made up of several moving parts; these are the treadle (*f*), a piece of wood shaped like a short-handled spatula and not unlike a ' butter-hand ', placed across the floor of the basal trough; (*g*) the lever-arm, a narrow wooden blade pivoted at the base of a long open slot cut in the upper end of the fall-block pillar (*e*) and a length of string tied at one end to the free end of the fall-lever and at the other to a trip-toggle—a flat piece of wood about two inches long by $\frac{3}{4}$ of an inch wide, cut to a chisel edge

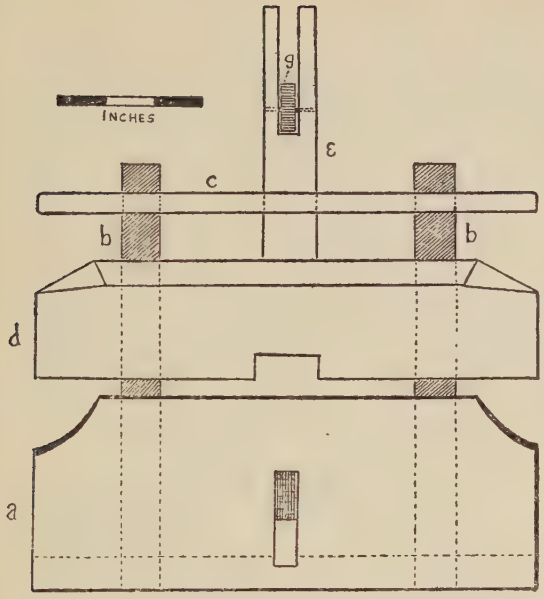

FIG. A. VIEW FROM THE FRONT OF A RAT-TRAP FROM UGTHORPE, NEAR WHITBY

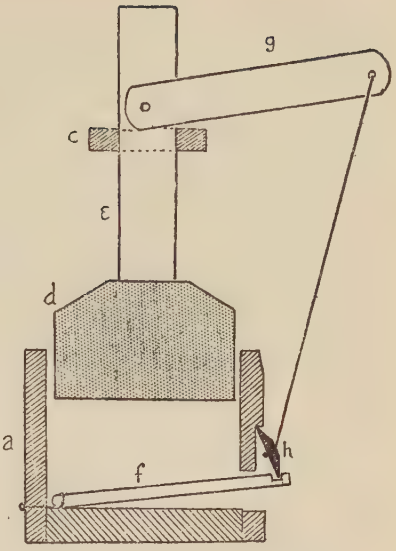

FIG. B. TRANSVERSE SECTION AT MID-LENGTH OF THE SAME TRAP TO SHOW THE WORKING OF THE TRIP MECHANISM

(*a*) basal ' box ', open at the ends ; (*b*) guide uprights of the scaffold, on which the fall-block (*d*) slides up and down ; (*c*) crossbar of the scaffold ; through it passes the central pillar (*e*), in which the lever-arm (*g*) is pivotted within an apical slot ; (*h*) the trip-toggle

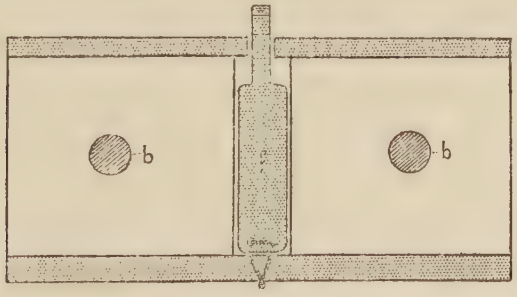

FIG. C. DIAGRAMMATIC PLAN OF THE BASAL PART OF THE SAME TRAP

b, *b*, the lower ends of the guide uprights inserted into the base board of the box ; *f*, the treadle, hinged at the inner end by means of a loop of cord ; at the other end is a notch to engage the lower edge of the trip-toggle

at each end. The broad end of the treadle is hinged by a strip of leather or by a loop of cord at the back of the basal box ; its short narrow ' handle ' is passed through a rectangular opening, about two inches high by three-quarters of an inch wide cut half way along in the front wall of the box ; near its free end a shallow notch is cut on the upper side. In rare cases the slot is open above, extending to the upper edge of the front wall of the box.

To set the trap, the length of the trip-string is adjusted, the fall-block is raised to the cross-bar of the scaffold and held there by the left hand, while with the right one end of the trip-toggle is fitted in the notch at the outer end of the treadle handle, the other being lightly caught against the edge of the upper lip of the treadle-handle aperture. To bait the trap, food is laid upon the blade of the treadle within the box.

In photographs of traps (FIGS. 6 and 7) from Sweden, the basal part is made from a solid block of wood in which a rather shallow rectangular cavity is hewn in the upper surface. This gives a low-sided ' box ' having ends as well as sides, whereas in England preference is for deep sides and open ends. The explanation of the peculiar form favoured in England as given by an old and experienced rat-catcher is that no rat will enter this kind of trap unless it has a clear and unobstructed view right through from end to end ; it wants to be assured of an open road out. Mice appear to be less suspicious for, as we shall see, the box in mouse-traps of this type has closed ends as in the continental rat-trap design.

One of the most notable deviations from the standard English pattern, is, curiously enough, seen in the solitary example known from Wales. In this unique trap (FIGS. 2, 3) which hails from Llandeilo Fawr in the west of Carmarthenshire and is now in the Carmarthenshire Museum, the pillar carrying the lever-arm is implanted in the fall-block slightly behind the central point and thereby becomes a trifle eccentric in position. So, instead of passing through a median hole in the scaffold cross-bar, it rakes slightly forward, pressing against the hinder edge of the bar over which the lever-arm rests horizontally when the trap is set. The cross-bar itself is curved concavely on the hinder side in order to facilitate the use of this unusual form of fall-block pillar.

The STRING-RELEASE TRAP (FIGS. 5, 7) dispenses with the central pillar and its lever-arm. Instead, the free end of the trip-string is passed through a hole bored at mid-length through the scaffold cross-bar, and made fast to a staple or bent nail fixed at the centre of the top

of the fall-block. By hauling on the trip-string the fall-block is drawn up against the cross-bar and there held suspended when the trip-toggle is fitted lightly between the treadle-arm notch and the upper edge of the treadle slot, or in a slight nick in the wood above the slot or (rarely) against the lower edge of the fall-block as in the circular Surrey examples (FIG. 5). When a mouse, scenting the bait, jumps upon the treadle within the box its weight depresses the treadle arm which acts as a trigger, setting the mechanism in motion by releasing the trip-toggle. This in turn destroys the equilibrium of the suspension, causing the block to fall with a crash upon the intruder. This mechanism is essentially the same as that employed in working the French guillotine where, however, a weighted knife sliding between the uprights of the scaffold takes the place of a heavy wooden block.

The ' box ' in the string-release trap is either of the Scandinavian type or it has four low sides formed by an all-round beading (FIG. 4). The usual size of the box is 4 ins. by 4 ins. ; it is not unusual to find two twin units combined upon a common base and sharing the same scaffold or gallows but otherwise independent, with separate guides, treadles and trip mechanism.

A few examples are of superior workmanship and finish, evidently made to the order of well-to-do patrons. Two Surrey traps (Worthing Museum), a large one for rats and a small one for mice (FIG. 5), have turned bases and cylindrical fall-blocks worked by string release in each case. In another instance (Leicester Museum) the fall-block runs on two unusually slender guides, so weak that the cross-bar of the scaffold has to be supported by a pillar at each end, rising from the square basal block outside of the circular cavity into which in this example the fall-block descends when the trap is sprung.

Until recently the only published notice of this curious trap was that by Gertrude Jekyll. In her *Old West Surrey* (1904) she gives sketchy text-figures of both the types without any detailed description other than that ' these home-made mouse-traps were in general use '. In 1937, consequent upon a notice in the *Field* calling attention to a new and admirable form of humane rat-trap recently ' invented ', Mr A. R. Pertwee of South Zeal in north Devon, wrote to the Editor to point out that the principle of the so-called ' invention ' was nothing new, being similar to that of a contrivance in his possession considered to be 200 years old. He has since informed me that he knows of another example at Hatherleigh, also in north Devon.

Mr Pertwee's trap is of special interest for it is the only instance

of the lever-arm type in which the guide rods do not run through vertical holes bored through the fall-block ; instead, they are replaced by upright pillars united above by a cross-bar. This scaffold straddles the 'box' obliquely, as the uprights are staggered to allow the outer end of the lever-arm to be directly over the toggle-catch when the trap is set ; one pillar is nailed to the front of the box four inches from one end, the other to the back, eight inches from the same end.

The result of widespread enquiries throughout the British Isles is the conclusion that the vertical dead-fall trap, in one or other of its two types or in both, was widely distributed throughout much the greater part of England until some seventy years ago ; the majority of the records come from northern, eastern and southeastern England, with extension into the Midlands up to the Welsh Marches. To particularize :—examples are known from every county except the following—Northumberland, Durham, Cheshire, Derby, Nottingham, Stafford, Rutland, Huntingdon, Northampton, Bedford, Oxford, Berks., Hampshire, Dorset, Somerset and Cornwall, nor is it found in Hereford and Monmouth. In view of the lack of interest in bygones so surprisingly common in many localities, coupled with the fact that many of the counties furnishing no records are surrounded by areas where the dead-fall trap is represented, it becomes morally certain that the distribution once included several of the counties returning no records. This inference applies particularly to Rutland, Huntingdon, Northampton, Bedford, Oxford and Berkshire. I fully expect to hear later that this trap has been in use in Northumberland and Durham, seeing that it is well authenticated for Cumberland, Westmorland, and Yorkshire.

Apart from the solitary record from southwest Wales already mentioned no suggestion of its use among the purely Celtic-speaking population of the Principality has been made. No other example is to be found in any Welsh Museum. Even at the National Museum, where enthusiasm for the collection of Welsh bygones is extremely lively, nothing had ever been heard or seen of this form of trap before my enquiry. Nor is it known in or from Cornwall, where Celtic speech has not long been extinct.

In Scotland, testimony to the former use of the dead-fall trap comes from Dumfries, where one informant states that he used this type some 50 years ago. From Midlothian, an officer in the Sanitary Department remembers its use in the neighbourhood of Edinburgh in pre-war days (say during the first decade of this century). Lastly, I

FIG. 1. A RAT TRAP FROM WHITBY (*see* p. 397)
Ph. J. Hornell

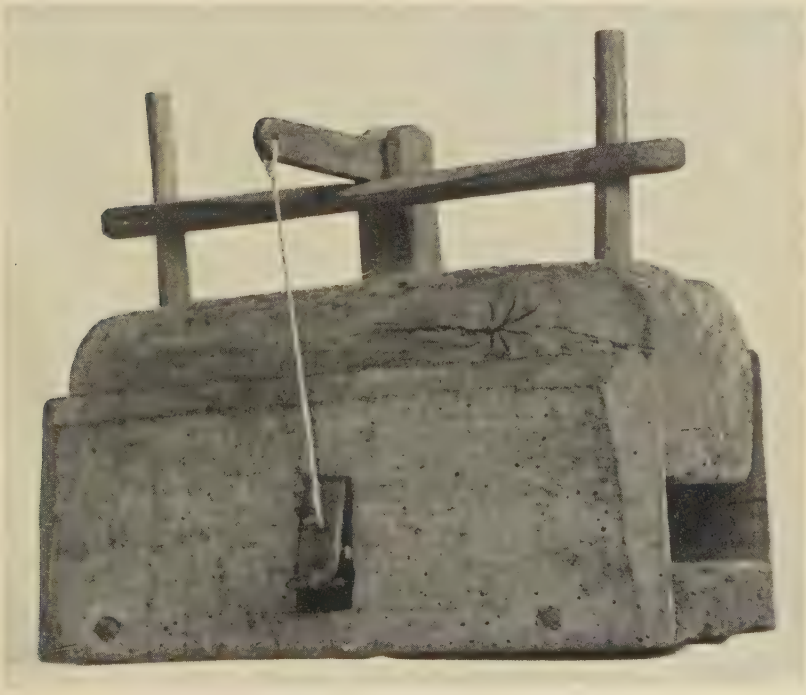

FIG. 2. THE CARMARTHEN RAT TRAP (*see* p. 398)
An unusual form of lever-arm trap from Llandeilo Fawr. The fall-block pillar is placed eccentric to the scaffold cross-bar
Ph. J. Hornell

facing p. 400

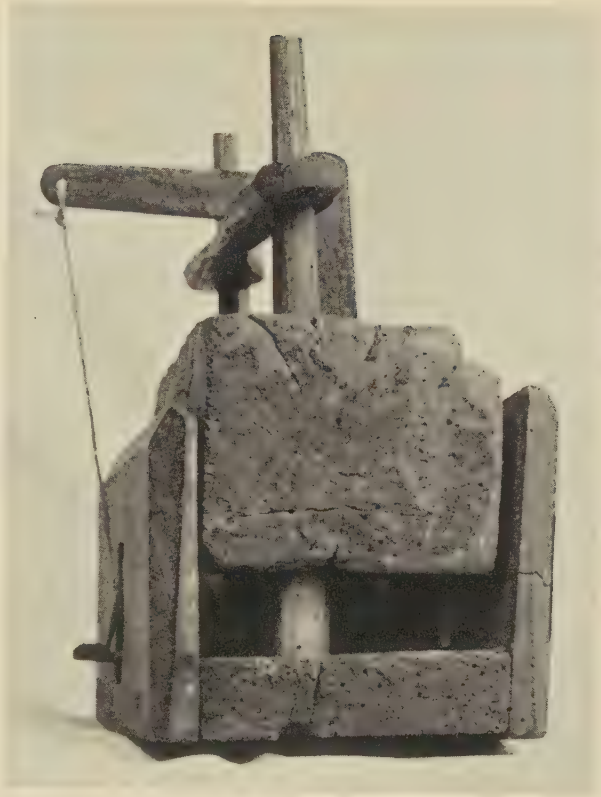

FIG. 3. THE CARMARTHEN DEAD-FALL TRAP, END VIEW (*see* p. 398)
Showing the open end and one of the guide-rods passing through the fall-block to insertion in the base board. The trip-string is too long to set the block at its proper working height
Ph. J. Hornell

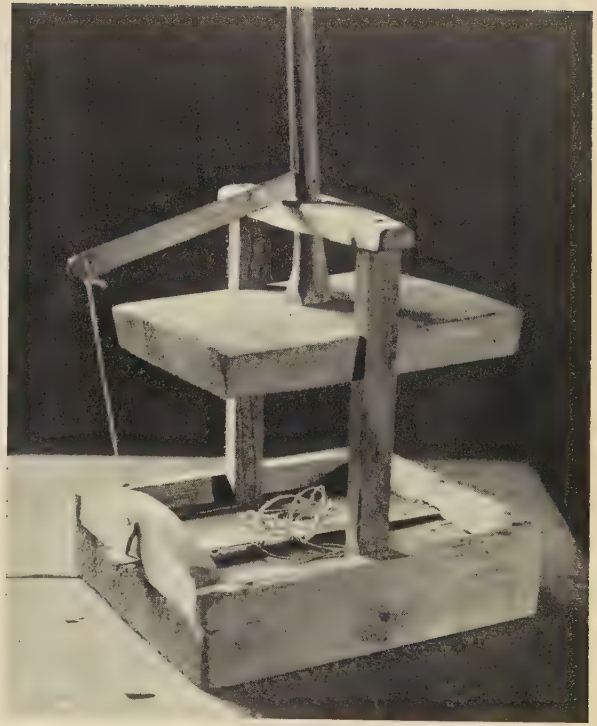

FIG. 4. A FINNISH RAT TRAP, NATIONAL MUSEUM OF FINLAND
(*see* pp. 399, 402)
By courtesy, the National Museum, Finland and Dr G. Lagercrantz

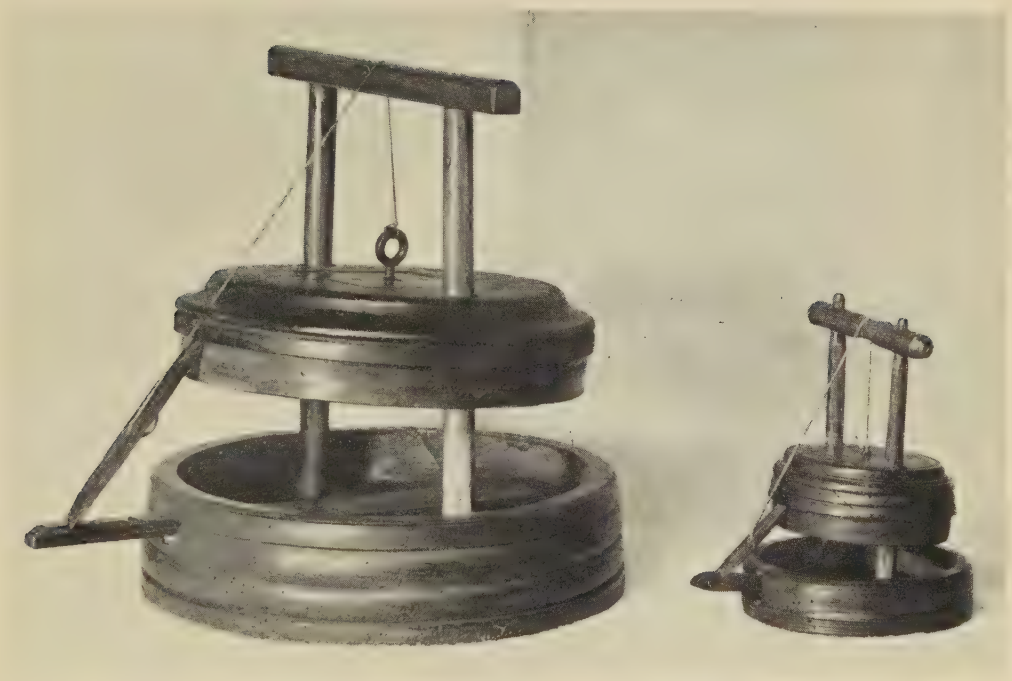

FIG. 5. SURREY TRAPS FOR RATS AND MICE, WORTHING MUSEUM (*see* pp. 398, 399)
The turned bases and blocks are exceptional. The usual form has a square base and a heavy cubical block. Frequently two units are combined, as in Fig. 7.

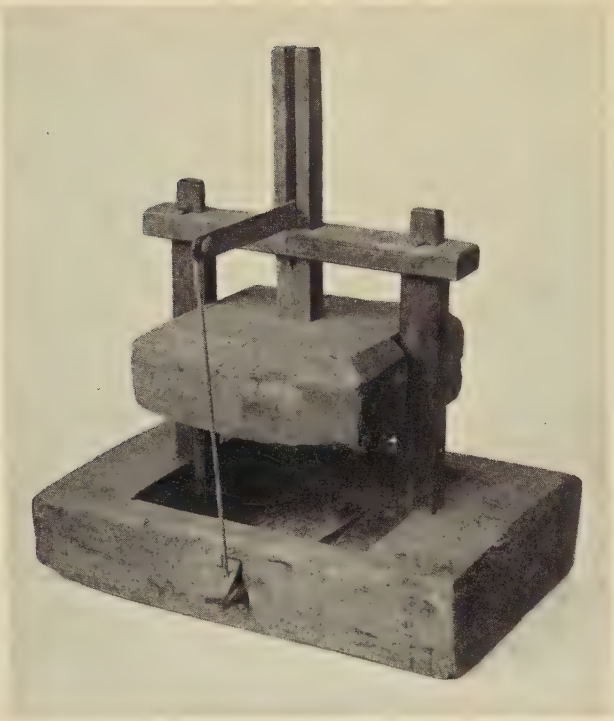

FIG. 6. RAT TRAP FROM NAS IN DALECARLIA, SWEDEN
(*see* p. 398)

In both figures 4 and 6 the block slides between the guides, whereas in the equivalent British form the guides pass through holes bored vertically through the block.

By courtesy of Dr Gösta Berg

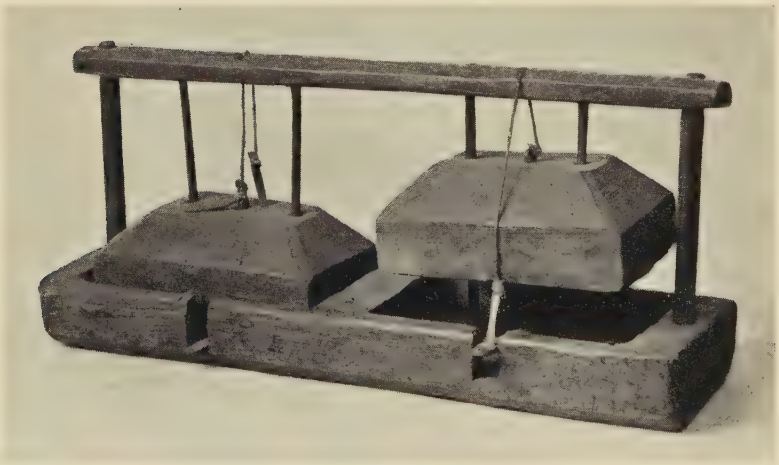

FIG. 7. RAT TRAP FROM ORSA PARISH, DALECARLIA, SWEDEN
(*see* pp. 398, 402)

By courtesy of Dr Gösta Berg

have information that a miller in the island of Hoy, Orkney Islands, was using this kind of trap up to six years ago.

Prolonged correspondence with the staffs of museums in northern Ireland and Eire and with Irish antiquaries interested in the recent past, has been barren of result; the conclusion is definite that traps of this design have never been in use in Ireland.

From the records of distribution given above it becomes clear that the regional range of the vertical dead-fall trap coincides closely with those areas where Anglo-Saxon and Danish populations have displaced or absorbed the Celtic-speaking Britons. This is emphasized by the negative evidence from Cornwall, Wales, Ireland, and the Celtic-speaking regions of Scotland. It is true that one example is known from Wales and three records come from Scotland; if we analyze these we find that the Welsh record is from a district adjoining Pembrokeshire, which suggests that its introduction may have been effected through the medium of Flemish and English settlers, whose descendants to this day exhibit a preference for English customs and the English language—in former days their settlements went by the name of 'Little England beyond Wales'.

As to Scotland the two mainland records occur in Lowland counties predominantly Saxon in population; both are noted for the advanced agricultural ability of their farmers and peasantry. As to the Orkneys, the Scandinavian origin of the population need not be stressed.

In most districts in Britain the dead-fall trap passed out of use at varying periods during the nineteenth century. When an estimate of the date of its disappearance is given, I fear that the answer too frequently is in the nature of a guess—usually 'about 50 years ago' or 'about the middle of last century' is the reply. Evidently there was great variation in the approximate date of disuse. In most localities this appears to have occurred within a few decades on either side of 1850. Among the recent dates are about 1913 for Midlothian; the same year for Norfolk (Dr L. W. G. Malcolm, Horniman Museum), and up to 1934 in the Orkneys, where it may still be in use. In one place alone have I positive evidence of its continued existence and use. This isolated survival is to be found in Cambridge, where a baker, Mr Frank Webster, finds this kind of trap invaluable in keeping his shop and bakehouse clear of vermin. He has three traps in use; all are of the string-release type. Two are small with bases about 4 ins. by 4 ins.; one is an old one made by Mr Webster's father about 1869, the other is a modern copy, home-made. The third example is of larger size,

intended for rats ; this too was made by Mr Webster in recent years, with the addition to the fall-block of a sheet of lead nailed to its upper surface to increase the crash-weight. Mr Webster maintains stoutly that these are the most effective of all traps for ridding a house of rats and mice.

Apart from the interest inherent in a mechanical contrivance so admirably adapted to the purpose in view, study of the regional distribution of these traps in Britain becomes of particular importance when we consider the range of distribution of corresponding traps of the same basic design upon the Continent. Dr Gösta Berg* who has written on these and other forms of traps kindly sent me photographs of two fall-traps from the province of Dalecarlia in south Sweden. One of these (FIG. 7), from the parish of Orsa, is of a double or twin-block example of the ordinary British trap of string-release type, but with the fall-blocks oblong in shape instead of being square. The other, from the parish of Näs (FIG. 6) is of a type so exceedingly rare in Britain that only a single instance is known and even this, a twin-block mouse-trap from Warwickshire in the Cheltenham Museum, differs in detail. In this Swedish trap, which belongs to the lever-arm type, the fall-block, instead of running on two guide rods passing vertically through its mass, slides up and down on two lateral squared pillars which fit in rectangular grooves cut in the ends of the block. The two pillars are connected above by a cross-bar through which passes the lever-arm support, inserted below at the centre of the fall-block.

Berg (*loc. cit.*), in a footnote gives references to records of the vertical dead-fall trap from Switzerland, Germany, Latvia, Hungary, Serbia and Macedonia. Dr S. Lagercrantz has also sent me a photograph of a trap (FIG. 4) from south Finland identical with the lever-arm trap from Sweden. It is or was common in south Finland and a record from Poland is mentioned by Dr Lagercrantz. He informs me that while this trap is very common in the northern and western parts of Hungary, it is scarce in the central region. In many places it has become obsolete as in England, but here and there it is still in use.

A copy made in iron is one of the modern minor products of industrialized Germany according to Dr Lagercrantz (in letter).

So far as we know the block-fall trap is not used in any of the so-called Latin countries—France, Spain, Portugal and Italy ; neither is it known in Asia, Africa or America.

* ' Nordskandinaviskt-nordeuropeiskt etnologiskt varjehanda ', *Rig*, III, 1933, pp. 118–39.

With the above knowledge of the Continental range of this trap, incomplete as it confessedly is, we shall now be able to see what significance attaches to its distribution in Britain. When the records of its occurrence are plotted on a map of England, these are found to spread fan-wise from the coast of East Anglia—the obvious arrival locality for an artifact coming from the southern coast of the North Sea. If this be granted, and if we couple with it the fact of the settlement of Flemings on an extensive scale in Norfolk and the adjacent counties in the twelfth century, and of a smaller but quite important settlement of the same people about the same time in Pembrokeshire (a locality close to the provenance of the solitary example recorded from Wales), the probability is considerable that this form of trap was introduced into England from the Low Countries in middle medieval times. Any earlier date is improbable.

The general conclusion at which we now arrive seems to be that the English dead-fall rat-trap is derived from an old and widely spread Central European culture extending from the Rhine on the west to the Russo-Polish marshes on the east, and from the Baltic on the north to the Alps and the Balkans on the south. But, like so many customs and appliances that have reached our shores from the Continent, the genius of Britain has wrought such modifications in the design most widely spread, as to impart to it a characteristic individuality wholly its own.

Archaeology in the Soviet Union

by Henry Field and Eugene Prostov

THE following archaeological notes[1] were received at Field Museum of Natural History, Chicago, from the Society for the Promotion of Cultural Relations with Foreign Countries (VOKS) in Moscow. The excavations were conducted under the auspices of the Institute for the History of Material Culture (IIMK) in Leningrad in cooperation with local archaeological societies or museums.

This report supplements recent articles[2] on archaeological research in the Soviet Union. It must be stated that some sections of the reports received by us from the U.S.S.R. often overlap material which we have already published.[3] The reports, however, are written by different investigators, and usually contain new, sometimes conflicting, data. It has therefore been our policy to publish whatever descriptions or archaeological investigations are received, eliminating only the obviously repetitious details. As our reports carry regional headings, it is a simple matter for the reader to compare the various versions of an investigation.

The material treated here has been arranged under the following geographical headings :—Karelian–Finnish S.S.R., European Russia, Crimea, Georgia, Central Asia (Uzbekistan and Kirghizia), and the Ural and Altai areas.

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[1] The greater part of the information was translated and summarized by Eugene Prostov from *Kratkie Soobshcheniia o dokladakh i polevykh issledovaniiakh Instituta Istorii Material'noi Kul'tury*. [Brief Communications on Reports and Field Investigations of the Institute for the History of Material Culture] (IIMK) Nos. 3–4, Leningrad, 1940. Under Prostov's supervision the Congressional Library System of transliteration has been used, with minor modifications, for all proper nouns in Russian.

[2] See A. M. Tallgren and others in *Eurasia Septentrionalis Antiqua* (ESA) since 1926 ; also E. Golomshtok, ' Anthropological Activities in Soviet Russia ', *American Anthropologist*, n.s. XXXV, 301–27, 1933 ; and A. Zolotarev, ' The Ancient Culture of North Asia ', *ibid.* XL, 13–23, 1938.

[3] See H. Field and E. Prostov, in the following articles : *American Anthropologist*, n.s. XXXVIII, 260–90, 1936 ; XXXIX, 457–90, 1937 ; XL, 653–79, 1938 ; and XLII, 211–35, 1940. *American Journal of Archaeology*, XLI, 618–20, 1937 ; XLII, 146–7, 295–8, 1938 ; XLIII, 331–2, 507, 1939 ; XLIV, 138, 1940. *American Journal of Semitic Languages and Literatures*, LII, 138–41, 1936 ; LIII, 123–4, 275–6, 1937 ; LV, 109–12, 333–6, 1938 ; LVI, 110–2, 172–4, 322–4, 438–40, 1939 ; LVII, 112, 194–6, 327–9, 1940. *Ars Islamic*, V, 233–71, 1938 ; VI, 158–66, 1939. *Asia*, XL, 272–7, 327–30, 1940. *Antiquity*, XII, 341–5, 1938 ; and XIII, 99–101, 1939.

Karelian–Finnish S.S.R.[4]

G. Gurina, of the Marr Institute of the History of Material Culture, conducted excavations in the district of Povenets on Lake Onega. During the search for Neolithic camp-sites on the Orov-Navolok Peninsula she located a settlement in which a bronze foundry and many bronze articles were unearthed. Other finds included superb pottery made from clay containing an admixture of asbestos.

Excavations along the Vuoksi River, on the northern coast of Lake Ladoga, and near the cities of Viipuri and Kakisalmi will begin shortly.

European Russia

1. G. A. Krivtsova-Grakova[5] published the results of the excavations which were conducted in 1929 under the auspices of the State Historical Museum in an extensive cemetery at Gorki in the Ykovlev *Raion*, Ivanovskaia *Oblast* and 250 kilometres northeast of Moscow. During two years of excavation 880 square metres were uncovered. Nineteen graves dug into the surface of a large hill, a part of which is occupied by Gorki, were ovoid or funnel-shaped. Except for a dorsal burial oriented to the west, with widespread flexed legs, and probably flexed elbows, human skeletons and bone objects were so disintegrated as to be unidentifiable.

Pottery objects of Fat'ianovo type predominated. The clay frequently included an admixture of coarse sand or mica. This hand-made pottery was made of strips 2.5 to 7.5 centimetres in width, coiled from a cup-shaped, rounded base. Large spherical, highly smoothed, medium-fired pots, generally with straight necks, were ornamented on the neck and shoulders by means of a small stamp which produced diamonds, squares, zigzags, and rows of straight or slanting lines. One vessel was stamped with two appliqué belts.

The burials also yielded a perforated stone axe, two polished wedge-shaped flint hatchets and a copper axe. In one tomb the excavators found a toy axe, 8.7 centimetres in length and made of well-fired, polished clay. This perforated type of stone axe is familiar in the Fat'-ianovo culture. In another tomb was a clay toy spoon, 7.5 centimetres in length.

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[4] Excerpted from Moscow *Daily News*, 15 August 1940.

[5] *Gorkinskii mogilnik* [The Burial Ground at Gorki] ' *Sbornik Statei po Arkheologii SSSR* ', *Trudy Gosudarstvennogo Istoricheskogo Muzeia*, VIII, pp. 57–72, Moscow, 1938.

On the basis of the recent discoveries of Fat'ianovo sites, Krivtsova-Grakova classified them into groups and attempted to elucidate the relation of the Fat'ianovo culture to the distribution of the 'pit and comb' ware. In the Moscow area she discerned two main variants of the Fat'ianovo culture, the 'Moscow' and the 'Yroslav' groups. In addition a third 'Eastern' group is represented by the Atli-Kasy cemetery described by P. N. Tret'iakov in 1931; and a fourth, the 'Southern' group near Briansk.

The 'Moscow' variant, which includes triangular notched flint arrowheads, arrow-straighteners and cord-ornamented, elongated pottery, is probably contemporaneous with the 'Catacomb' and the 'Dnieper' cultures of southern Russia, which are attributed to the third millennium B.C. This includes the burials at Sushchevo, Istrinsk, Davydkino, Kuz'mino, and on Ivanovo Mountain.

The Yroslav group, showing highly advanced forms of spherical pottery decorated with stamp ornament and relatively highly developed metallurgy, probably belongs to the second millennium before our era. This group includes the burials at Fat'ianovo, Goviadinovo, Gorki and Vaulovo.

On the theory that the Seimino burials, included pottery reminiscent of various types of Fat'ianovo ware, belong to the same culture, it is possible to suppose that in the Volga-Oka basin a variant of the Fat'ianovo culture lasted down to the end of the second millennium B.C. This group is definitely contemporaneous with the 'pit and comb' pottery culture.

2. M. E. Foss[6] described the Neolithic burials from Kubenino near Kargopol. Of particular interest were three interments lying in the clay beneath the main cultural stratum. All three burials were prone with extended legs and slightly bent arms; two were oriented to the south, one to the north. The skulls had probably been shattered at the time of burial. The skeletons were near the hearth in shallow tombs of irregular outline. The first of the graves, which had been covered originally with a pile of stones, did not yield any objects.

The second burial included a bone anthropomorphic but hoofed figurine, which was buried face down at the left of the pelvic bones of the skeleton, two bone pendants, three bone awls, and a fragment of bone carving of a hoofed leg.

[6] M. E. Foss, '*Pogrebeniia na stoianke Kubenino*' [Burials at Kubenino] *Sbornik Statei po arkheologii SSSR, Trudy Gosudarstvennogo istoricheskogo muzeia*, VIII, pp. 73–91, Moscow, 1938.

The bottom of the third grave was covered with dark red ochre mixed with ashes and coals. The bones were well-preserved and completely permeated with ochre. This burial was accompanied by a greater number of objects. To the left of the skull was a fragment of a flint spearhead, pointing to the skeleton's temple. Another fragment of this spearhead was under the skull. Near the right temple was found a stylus-shaped bone arrowhead. Five bone pendants, forming a necklace, were found near the neck. One of the beads apparently depicted a swan's head ; another was elongated and terminated in a hoof (?) ; the third resembled an awl ; the fourth was a styloid bone of elk, worked at the end ; and the fifth was an unworked bird bone. Under the pelvis were found twenty-nine buckles of beaver incisors, and mandibular fragments of otter and marten serving as pendants. A horn knife or awl handle was found beside the belt. To the right of the pelvis lay a large bone chisel and an armless and legless human figurine of horn. A laminated bone pendant fragment with carved ornament was found close to the left femur. Near the right forearm were found an arrowhead, a flint scraper, and a badly-worn flint, probably used in making fire. Another arrowhead lay near the pelvic girdle. A large split tubular bone, probably of bear, and a bear claw were found near the left tibia.

3. According to Tret'iakov,[7] who attempted to identify the early eastern Slavic archaeological monuments with the Slavic tribes mentioned by Nestor's Chronicle, the most important period was that of the first half of the first millennium A.D. The monuments attributed to the beginning of the second millennium, which have heretofore been used extensively in the study of the tribal archaeology of eastern Slavic tribes, are no longer deemed to be valid for the study of the ethnogeography of these ancient tribes.

The archaeological monuments of the second half of the first millennium A.D. formed several distinct groups. The most northerly of these groups, which stand near Lake Ilmen, is characterized by the so-called ' Novgorod sopki ', high tumuli containing multiple incinerated burials. The oldest of these tumuli are attributed to the sixth or seventh century, the latest to the ninth or tenth century A.D. In the later periods these *Novgorod sopki* are replaced by the ordinary low kurgans, containing single or double, incinerated burials.

[7] P. N. Tret'iakov, ' Archaeological monuments of eastern Slavic peoples in connection with the problems of ethnogenesis ' in *Kratkie Soobshcheniia*, IIMK, II, pp. 3–5, 1939.

The second of the groups occupied the upper course of the Dnieper, western Dvina, and the Volga, as well as the southern part of the Valdai highlands, and formed a wedge to the north along the eastern shore of Chudskoe Lake. This area is characterized by the so-called long kurgans containing collective incinerated burials. The oldest of these long barrows are attributed to the fifth or sixth century A.D. During the ninth or tenth century they were gradually replaced by individual round tumuli.

The third group is represented by the burial structures in the area along the upper course of the Oka River, extending as far as the upper reaches of the Don. These tumuli, attributed to the period from the sixth to the tenth centuries, contained structures resembling wooden log-cabins, which enclosed the remains of incinerated burials.

Distinctions other than those of mortuary customs differentiated the three groups. The third or Oka group was characterized by *gorodishches* and by sites of the so-called Moshchin type.

The three groups belonged to the Slaveni, Krivichi, and Viatichi peoples of the old Russian Chronicles, together with the Lithuanian-Baltic tribes and those of the western Volga. The last two groups differed sharply from those of the Slavic peoples. On the basis of the more detailed chronological subdivision of the monuments, Tret'iakov found that during the period from the seventh to the tenth century the Slavs continued to penetrate northward from Lake Ilmen in the direction of Lake Beloe down the Volga into what are now the Rostov and Suzdal areas, and through the upper reaches of the Don probably into the middle Oka region.

Two other local groups of Slavic monuments divided by the Dnieper were found further south in the Desna and Sejm basins. The first group was formed by the so-called Romny (' Romenskii ') type of *gorodishche* containing incinerated urn burials ; the second group by the southern White Russian *gorodishches*. Still further south, in the Ukraine, the middle Dnieper ' urn-burial fields ' are considered to be Slavic, together with the accompanying unfortified settlements (*selishches*) and *gorodishches*. These monuments belong to a period from the beginning of the first millennium to the sixth or seventh century, when they are replaced in turn by groups of tumuli and other Slavic monuments of the end of the first millennium A.D. Having for their eastern boundary the region of Kharkov, most of these monuments are located on the shores of the Dnieper between Kiev and Dnepropetrovsk, and in the region of the right bank, progressing in a broad belt

westward toward Central Europe. The genetical connexion between the urn-burial culture and that of the Scytho-Sarmatian period of the Dnieper was first indicated at the end of the nineteenth century. In the west this culture is connected with the so-called Luzhitsa culture of the Bronze Age and the Early Iron Age.

A comparative study of the cultures of the southern and northern Slavic tribes of the eastern group indicates no genetic connexion. The culture of the southern tribes developed under a certain influence of ancient Mediterranean civilization. At the beginning of the present era it had the character of a Roman provincial culture. On the other hand the culture of the northern tribes down to the end of the first millennium A.D. was distinguished by a greater primitiveness. At the same time data are available pointing to the deep local roots of the cultures of all the northern tribes.

Judging by the archaeological finds the formation of the eastern Slavs as a unity belongs to the second half of the first millennium A.D. At that period their primitive social order was dying. The growing economic and political connexions were breaking through the boundaries of the old tribal formations. A very strong role in the consolidation of the eastern Slavs was apparently played by the movement of the barbarian tribes dwelling to the north of the Eastern Roman Empire, which was terminated in the seventh or eighth centuries by the Slavic invasions of the Balkan Peninsula. The southward movement of the Slavic tribes also continued during the Khazar period. In the east it was terminated when the Slavs settled on the lower Don and on the Taman.

4. According to I. I. Liapushkin,[8] after an interruption of three years the Sarkel Expedition of the Institute for the History of Material Culture (IIMK) was resumed during 1939 on the right bank of the Don river, eight kilometres below the Cossack settlement at Tsymlianskaia. The *gorodishche* was located on the seventy-metre terrace, formed by the delta of two ravines opening into the river. This highly fortified *gorodishche*, commanding the important waterway connecting the steppes with the cities of the Sea of Azov and the Black Sea littorals, and with the Caspian Sea by way of the Volga, existed between the eighth and tenth centuries. Three cultural levels were uncovered. The lowest stratum, which was formed by the clay floor of a building, yielded a few objects including iron slag, animal bones, and some handmade pottery. Of

[8] *Raskopki pravoberezhnogo Tsymlianskogo gorodishcha* [Excavations of the *gorodishche* on the right bank near Tsymliansk] in *Kratkie Soobshcheniia*, IIMK, IV, pp. 58–62, 1940.

particular interest were the remains of a dwelling of the semi-dugout type. This was probably a conical structure similar to a yurt. The lower part consisted of an oval pit (2.5 by 1.8 metres) plastered with clay on the walls and on the floor, and with a round hearth pit near the north wall. Large, flat-bottomed vessels of Maiatskoe type with slightly convex walls and sharply flaring lips decorated with notches were found both inside and outside the dwelling.

The second period was represented by brick and mortar buildings similar to those of the Sarkel *gorodishche*. To this period also belong the remains of fortress walls, 4.5 metres thick and surmounted with round towers, built of dressed white limestone. The pottery, almost entirely wheel-made, consisted of vessels with incised linear and wavy ornamentation ; polished ware of Saltovo types ; ovoid amphorae ; and unornamented well-fired pots of firm, gray clay.

This period was also characterized by a profusion of iron objects; weapons (arrowheads and spearheads) ; bits and stirrups ; and various implements including knives, fragments of buckets, sickles, axes and fish-hooks. Among the few personal ornaments were beads, fragments of metallic mirrors, an earring, and several belt buckles. The second period was terminated by the destruction of the fortifications, materials of which were used for construction during the third period. This destruction could have occurred during the capture of the Khazar city of Belaia Vezha by Sviatoslav Igorevich, Prince of Kiev, in the year 965, as recorded in one of the old Russian Chronicles. Identification of this site with Belaia Vezha had been anticipated by M. I. Artamonov.

The third period was characterized by yurt-like semi-dugout dwellings related closely to those of the first period. The remains of these buildings consisted of clay-paved circular or oval shallow pits, occasionally double (2.5 to 3.0 metres in diameter), with a hearth in the centre. Many dwellings yielded human skeletons with no orientation. From the rubble in storage pits of other houses fish-hooks, chisels, scythes, ploughshares, spades and sickles were uncovered. The abrupt cessation of life in this period probably occurred during one of the invasions of the steppe tribes at the end of the tenth or at the beginning of the eleventh century, at which time after the downfall of the Khazar Kaganate these nomads were undisputed masters of the southern Russian steppes. Some traces of an attempt to repopulate and even to refortify the *gorodishche* at some later period were also discovered.

The Crimea

V. F. Gaidukevich[9] summarizes the results obtained during 1932–1939 by the excavations of the Bosporean Expedition at Tiritace (Tiritaka), under the joint sponsorship of the Institute for the History of Material Culture (IIMK) and the Kertch Archaeological Museum. Although the early authors referred to Tiritace as a city, the excavations disclosed that both in general planning and in many other essential traits this settlement did not resemble the usual ancient cities. Tiritace, however, was a well-developed Bosporean industrial settlement, devoted primarily to fish-salting.

During the Roman period Tiritace was one of the most important centres for the export of fish products. The excavations at the western part of the site were a continuation of those of 1938, during which a building of the sixth century B.C. containing archaic terracottas and many other objects was discovered. During 1939 this building and many adjoining service structures were uncovered. These included a barn or storeroom, a paved courtyard, a basement with a flight of steps leading into it, and extensive grain storage pits lined with stone.

A late Roman dwelling complex was buried under a stratum of débris 3.5 metres thick. The walls were preserved to a height of 2.0 metres. The main building was paved with flagstones and communicated with a small courtyard also paved with flags. In the floor of this building, opposite the entrance, was sunk a large pithos with a capacity of several hundred litres. Near it were found many charred grains of wheat and several hand-mills, indicating that the vessel was used for grain storage. A pit, one metre in diameter, 0.68 metre in depth, and filled with ashes, contained a pottery lamp, a bone needle for weaving fish-nets, an iron hammer, whetstones, and a grey pottery pitcher of Sarmatian type decorated by a band of intersecting lines. Upon the floor were also scattered many fragments of moulded pottery ; several lamps ; a round bronze mirror with an eyelet in the centre ; clay spindle-whorls ; fragments of glass vessels and red lacquer-ware platters of late Roman type, one of which was stamped with a cross ; and several bronze coins. Many large, pointed amphorae of the late Roman period were also found ; several had been repaired with lead rivets. The building had perished as a result of a conflagration ; the floor was covered by coal and ashes from the incinerated wooden parts of the

[9] '*Itogi poslednikh raskopok drevnei Tiritaki*' [Results of the latest excavations at ancient Tiritace] in *Kratkie Soobshcheniia*, IIMK, IV, pp. 54–8, 1940.

structure. Many of the amphorae, which had apparently been stored on the second floor, had fallen down during the fire. An outside stone stairway parallel with one of the walls of the building led to the upper storey.

The prevalence of burned buildings, of which several had been previously discovered, suggests that Tiritace was attacked and partially destroyed during the fourth century A.D. The finds from the late Roman building also included the remains of a charred cable, probably a part of some sort of fishing gear, and of two dozen stone net-weights. A small fish-salting cistern (1.75 by 1.37 by 1.90 metres) was found in an adjoining outhouse.

In the lower part of one of the walls of the main structure was unearthed a clay-covered niche, with the bones of a young pig and of a lamb, covered by sand, together with bony plates of hausen (*Acipenser huso*) and sherds of amphorae. This niche, which also contained a clay lamp, was apparently connected with some ritual.

A small stone bench used for pressing grapes was found on a dais in the courtyard. Many finds connected with wineries indicate the important role played by viticulture in the economic life of the Bosporus during the late Hellenistic and Roman periods, when the importation of wines from abroad became curtailed. A second large winery of the second century B.C., discovered in 1939, had been partially buried by a railroad embankment. None the less, the extensive platform used for pressing grapes was uncovered, together with a cistern for the storage of grape juice with a groove leading from the platform. Both the platform and the cistern were faced with a white cement differing in composition from the Roman cement of that period. This evidence will help to reconstruct the evolution of viticultural technique in Tiritace from the second century B.C. to the third century A.D.

Recent excavations indicated that Tiritace was sacked during the fourth century A.D. The destruction of this city occurred as a result of one of the mass tribal migrations in the northern Black Sea area which led to the final dissolution of the Bosporean state. However, Tiritace did not disappear altogether at that time because many of the objects unearthed belonged to the early medieval period. For example, in the western part of the city a quantity of pottery was excavated, including a pithos stamped with the potter's name and an incised cross of the type attributed to the fifth or sixth century A.D. The fisheries continued to exist during this period although most of the Roman cisterns had become filled. The main occupation of the local population seems to

have been agriculture. Tiritace was abandoned during the seventh or eighth century of our era.

The excavations also yielded many sherds of archaic ware, including a painted fragment. Particularly abundant were the finds from a late Roman house, and also those from a Bosporean house of the third or fourth century A.D.

A stoppered amphora, attributed to the fourth century of our era, found near one of the fish-salting complexes, contained nearly 3.5 kilograms of crude oil (petroleum). The amphora was of the elongated, cylindrical type with a conical bottom. The neck had been closed by straw which, when permeated with the solidified crude oil, formed a completely hermetic seal. The liquid was analyzed by V. V. IAnovskii of the Leningrad Chemico–Technical Institute, who described it as ' crude oil or a product of crude oil '. According to the classical authors crude oil was used not only for lighting purposes but also as a medicine.

Georgia

The Nicholas Marr Institute for the Study of Language, History and Material Culture (EIMKI) in Tbilisi (formerly Tiflis) was part of the Georgian branch of the Academy of Sciences of the U.S.S.R.

Melikset-Begov, a member of the staff of EIMKI, published an historical monograph[10] on the Armazni area. Another report by Kalandadze[11] on excavations in the Armazni Gorge, describes a group of ancient monuments near the confluence of the Kura and Aragva rivers in the vicinity of the ancient Georgian capital of Mtskheti, thirty kilometres northwest of Tbilisi.

The Armazni area contained a fortified town known to Strabo as ΆΡΜΟΣΙΚΗ and to Pliny as Harmastis. This was the oldest capital of Iberia or Kartlia. Among the archaeological sites in the Armazni Gorge were the ruins of the Armaz monastery (*Armazis Monasteri* or *Monasteri Ahalkalakuri*, ' of the new city '); remains of a settlement (Armazi or Kartli) ; a castle, known to Leonti Mroveli, the Georgian historian of the eleventh century, as ' the castle at the point of the

[10] L. Melikset–Begov, '*Armazni* : *istoriko-arkheologicheskii ocherk*' [Historico-archaeological description of Armazni], '*Masalebi Sakartvelos da Kavkasiis Istoriisatvis*' [Materials for the Study of Georgian and Caucasian History] No. 2, pp. 1–119, 1938. [In Russian, with Georgian summary].

[11] A. Kalandadze, '*Armazis arkeologiuri ekspeditsiis tzinastzari angarishi*' [Excavations by the Armaz Archaeological Expedition] of EIMKI, in *Moambe* [Bulletin] II, No. 3, pp. 365–400, 1937. [In Georgian].

Armaz prominence ' ; and, on a mountain nearby, an ancient church of St. Nina (*Ninotzminda*), and the ruins of a fortification.

The area is mentioned under its present name in the oldest monument of Georgian historical literature, the *Kartlis-Moktseva* (' The Conversion of Georgia ').

According to Melikset-Begov, the castle near the confluence of the Kura and Aragva rivers marked the northerly boundary of the Achaemenid rulers and their successors in Trans-Caucasia. Consequently, the area is rich in place-names of Iranian origin. Mroveli wrote that the area was originally known as Kartli after the legendary forefather of the Georgians, Kartlos, son of Targamos, great-grandnephew of Noah, who came here from Mount Ararat. According to the same historian and the Chronicle of ' The Conversion of Georgia ', the area was named Armazni after an idol (whom Melikset-Begov identifies with Ahura-Mazda) erected by Georgian King Pharnavaz in the third or second century B.C., but destroyed during an earthquake at the arrival of St. Nina, who converted Georgia.

Mroveli states that the fortifications on Armazi mountain and the castle on the prominence were built by Afridun's viceroy, Ardam (fourth century B.C.), who taught the Georgians the use of cemented stone. He is also credited with having built the cemented walls of Mtskheti.

Melikset-Begov considered that the structures, associated with the star worship of the Georgians, were of Neolithic type.

Dion Cassius stated that the Acropolis of Armazi was occupied by Pompey in the year A.D. 65. In the middle of the first century[12] the Armazni area formed a separate kingdom on the right bank of the Kura river, the left bank being occupied by a kingdom with its capital at Mtskheti.

The fortress at Armazi, ruined during an earthquake, was restored by King Bakur II, and destroyed subsequently by the Persians under Firuz before 466. After the Persian wars, Armazi was again restored, but its importance decreased upon the growth of the fortress of Tiflis.

During the Arab invasion (643–645), Armazi is mentioned in the Acts issued by Ibn Abd-al-Malik Maslama (recorded by Al Tabari) as one of the towns furnishing tribute. The town was finally destroyed during the invasion of Marwan the Deaf (663–668) and was never again rebuilt.

[12] Prince Vakhushti gave the date as A.D. 55–129.

The monastery, built upon the site of a pagan sanctuary, is first mentioned during the eleventh century. It was destroyed repeatedly by the Mongol horde and during the invasion of Shah Abbas (1616), and was finally abandoned early in the eighteenth century after destruction by the Turks. According to Melikset-Begov, the buildings, now extant but largely ruined, date from the middle of the seventeenth century.

The church at the top of Armazni mountain, known as St. Nina, was established by King Bakur II (A.D. 342 or 362 to 364), who caused it to be erected upon the spot occupied by the Armazni idol. The modern building is of far more recent date. Melikset-Begov suggests that the ancient church actually stood on the site of the original main castle of Armazni.

The small castle on the prominence has been attributed by Melikset-Begov to ' Early Feudal Georgian ', namely, the first to sixth century A.D. It is mentioned as early as the fourth century B.C.

According to numerous contemporary (1392–1673) grants made to the Patriarch of Mtskheti by the Georgian kings, Armazi with its serfs was the property of the See, which also levied a tax on each load carried up or down the gorge.

To summarize, the area of Armazni contained the ruins of two villages ; several ancient burial grounds, some of which contained inhumations in stone boxes, first excavated by G. K. Nioradze ; and many caves.

According to Kalandadze's report the first large-scale excavations were undertaken here during 1937 by the Georgian Branch of the Academy of Sciences of the U.S.S.R. Kalandadze gave a detailed description of the excavation of a large bath of the first century of our era, reminiscent of a Roman bath, located at the confluence of the Kura and the Aragva rivers.

Melikset-Begov enumerated briefly the finds from the Armazni district of which the most famous was the inscription in Greek (dated A.D. 75), discovered in 1867 and now deposited in the Georgian Museum in Tbilisi. According to this inscription, the Romans, in token of the friendship of the Iberian king, Mithridates, son of King Pharasman and of his son, Amasaspes, and of the people, with the Caesar Vespasian Augustus, Titus Caesar, son of Augustus and Domitian Caesar, son of Augustus, ' fortified the walls ' [apparently of the Armaz fortress].

Other objects, mainly in the collections of the Georgian Museum

include five Georgian inscriptions, glazed tiles, and bronze and glass ornaments.[13]

Grave-goods from Karsan nearby have been described by Nioradze.[14] The ancient glass factory at the same place was described by Lemlein.[15]

Central Asia

1. Kirghiz S.S.R. During 1939 excavations were conducted in the Talas Valley by the Expedition from the Institute for the History of Material Culture (IIMK) and the Hermitage Museum, both in Leningrad, under the leadership of A. N. Bernshtam.[16]

At Kenkol, near the headwaters of the Talas river, eight tumuli, seven with catacomb burials, yielded objects which threw light on the history of the nomads during the first century of our era. The catacombs, cut out of the loess with a tool closely related to the modern Kirghiz *chot* (? adze), were dug beneath the tumulus at a depth of 3.5 metres from the surface of the ground. The earthwork usually contained one vessel, poorly fired, although some were of very excellent, probably Soghdian, workmanship, and others had polished ornamentation. A slanting corridor led into each catacomb, and the entrance was covered by a stone slab.

Burials were usually double, sometimes containing children. The skeletons belonged to a mixed group, some of them retaining Mongoloid traits. Each cranium, including those of children, had undergone artificial cranial deformation. Two skeletons of Europoids, possibly slaves of the local tribes belonging to the Pamir-Farghana race, were placed across the entrance to one catacomb containing two Mongoloid skeletons with deformed crania. The skeletons of the slaves, accompanied by pottery vessels, were placed on a crude bier of twigs.

The rich grave-furniture of the catacombs consisted of wooden objects, including bowls and goblets, as well as small wooden tables for the preparation of foods. A few of the wooden vessels had been mended with copper wire and copper patches. Two catacombs contained parts of cradles very similar to the *peshik bala* [cradles] of the modern Kirghiz. In one catacomb stood a bed consisting of bent boards with a border of scantlings forming a raised border.

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[13] These are described by P. S. Uvarova in *Museum Caucasicum* v, 93–94.

[14] G. K. Nioradze, *Karsanis Hevis Sasaphleo*, Bull. Mus. Georgi, iv, 1–54, 1926.

[15] G. G. Lemlein, *Saistorio Krebuli*, iii, 7, 1921.

[16] *Arkheologicheskie issledovaniia o doline z Talas* [Archaeological Investigations in the Talas Valley] in *Kratkie Soobshcheniia*, IIMK, iv, 45–6, 1940.

The majority of the catacombs contained burials of warriors accompanied by their weapons, wooden arrows with triangular iron arrowheads of Scythian type, large hafted bone arrows, and bone inlays from composite bows. The burials of women were accompanied by wooden vessels, bast baskets, cooking pots, and deep vessels with handles, for water storage.

In one catacomb were mummified bodies with well-preserved clothing. They had been placed on a bier, which consisted of boards resting on stones, covered with hay. The male skeleton, lying on his back, was oriented from east to west with the head turned toward the north. At his left hand was a staff. The clothing consisted of a full shirt of silk, leather breeches and soft leather boots of the type still worn in Central Asia. Under the head was placed a reed pillow. The body of the woman was only partially mummified. Her head and face were covered with a piece of silk tied at the nape and by a band of red silk on the head. Small beads fastened with a copper hasp, were around the neck. She was dressed in a silk robe held together in front, and in leather breeches and soft boots. A wooden goblet with a handle was placed in a niche beside the body. Beside the head were placed a wooden bowl with food and an earthenware water-jug, while near the feet stood a clay cooking-pot, containing a hollowed pumpkin of the type now used for carrying chewing tobacco, and a stone spindle-whorl. Lamps of lightly baked clay were placed at the head and at the foot of the burial. The silk used in the clothes was of Chinese workmanship of the Han period (second century B.C. to second century A.D.). This was the fifth discovery of Han silk and the second discovery of clothing of that period. The cut of the clothing and the embroidery of the sleeves were similar to the finds from the Noin-Ula burials in Mongolia. On the basis of the well-preserved fragments it was possible to reconstruct the bow and arrow.

These burials are thought to belong to some nomadic tribe, possibly the Huns, at the beginning of our era. The bodies represent the most ancient finds of the Mongoloid type of Central Asia. The culture of the catacombs is most closely connected with that of the modern Turkish-speaking peoples of Central Asia.

2. During 1939 a joint Expedition from the Institute for the History of Material Culture (IIMK), and the Scientific Committee of the Soviet of Peoples Commissars of the Kirghiz S.S.R., continued the work of the previous season in the Chu Valley and also in the valleys of the Small and Great Kemin rivers. Under the direction of A. N.

Bernshtam,[17] the excavations of the *gorodishches* at Krasnaia Rechka (Saryg) were limited to the surrounding hills and extramural structures. The ruins of a Soghdian castle, consisting of eight rooms in the form of elongated rectangles, was discovered. This was a typical *keshk*, a fortified dwelling of a slave-owning landlord. The abandoned castle, later utilized as a Zoroastrian and Mohammedan cemetery, was dated tentatively in the sixth or seventh century A.D.

The Zoroastrian burials were in large ossuary urns with decorated incised lids. In one grave Turgesh coins and a golden armlet with the effigy of a human head were unearthed. The Mohammedan cemetery of the Karakhanid period did not contain any grave-furniture.

In the second Moslem *tepe*, burials with metal objects and many beads were uncovered. Excavations of the third *tepe* disclosed the interior of a stucco building decorated with frescoes. Another Moslem building with a square ground plan was found. This was attributed to the eleventh or twelfth century. Among objects of particular interest was the lip of a storage vessel stamped with a Soghdian inscription.

Near the *gorodishches* three dwelling-complexes were discovered. One of these consisted of the remains of an unbaked brick structure with stucco walls and with carved stucco ornamentation retaining vestiges of painting. Among the finds was a curious pot handle in the form of a human figure of Buddhistic type. At another site, a building enclosing storage pits was uncovered. Four cultural strata were found ; the Soghdian stratum yielded some pottery of archaic type.

The third excavation disclosed another unbaked brick dwelling with the walls decorated by carving and painting over the unbaked brick surface, and closely reminiscent of the panels from Samarra. Plant-ornament including leaves and grape-vine formed the motifs. The painted decorations were of geometric ornamentation.

The objects from the *gorodishche* were attributed to the period from the fifth to the twelfth century A.D.

The excavations at Ak Peshin were a continuation of those of 1938 and were concentrated in the supposed *kitai* (*Kara Khitai*) quarter of the town. The finds included tiles of Chinese type, tiles ornamented with appliqué ornamentation of plant elements, and a peculiar type of pottery differing entirely from any known examples from Central Asia but similar to Kharakhoto ware. Evidence was obtained that the territory to the southeast of the *gorodishche* was the *kitai* of Balasaghun.

[17] '*Arkheologicheskie issledovaniia v Kirgizii*', in *Kratkie Soobshcheniia*, IIMK, IV, 47–8, 1940.

During 1939 the Expedition completed the mapping of ancient towns along the Chu river. Large stone human effigies (*babas*) were recorded near the Small Kemin river. In the valley of the Great Kemin two fortified *gorodishches* were located. These were probably the *gorodishches* of ancient Suyab, which according to the testimony of available sources consisted of two parts, Sagur and Kubal. The city of Newaket, located between Balasaghun and Suyab, was identified with the ruins near Orlovka in the Chu region.

In the Chon Kemin gorge a burial-ground of the Turki period (sixth to eighth century) was discovered. Several stone effigies nearby were anthropomorphic representations of obviously non-Turkish type, with European features and long beards.

The work in Kirghizia disclosed the earliest type of settlement in the Seveb river area, preceding that of the formation of the towns, and consisting of groups of separate fortified villages of the Soghdians such as the one at Krasnaia Rechka *gorodishche*. The medieval town, with its *shahristan*, *rabad* and *kunya-ark* is represented by Ak Peshin (Balasaghun), which according to Barthold was the capital of the Karakhanids and the Kitai in the eleventh or twelfth century A.D.

Uzbek S.S.R. During the construction of the irrigation canal in the southern part of the Farghana Valley, 270 kilometres in length, and involving the removal of 18 million cubic metres of soil, an Expedition organized by the Scientific Committee of the Soviet of Peoples Commissars of the Uzbek S.S.R. supervised the removal of archaeological finds.

The Expedition was divided into three groups of eleven research workers, all under M. E. Masson.[18] At the conclusion of the work the Expedition engaged in the survey of the area adjoining the canal.

The objects ranged from flint implements to specimens from the period of the last Khanate of Khokand. The richest finds, belonging to the period before the Arab conquest, included many bronze spear-points and arrowheads, rarely found in Farghana. Particularly well-represented were the remains of the Davanian culture (from Ta-yüan) mentioned in Chinese historical sources and attributed to the second half of the first millennium B.C. This culture, represented by several *gorodishches* and many burials, is characterized by pottery with scratched

[18] M. E. Masson, '*Ekspeditsiia arkheologicheskogo nadzora na stroitel'stve Bol'shogo Ferganskogo kanala im I.V. Stalina*' [Archaeological Supervision during construction of the Great Farghana Canal named after I. V. Stalin] in *Kratkie Soobshcheniia*, IIMK, IV, 52–4, 1940.

ornament. Among important objects was a cylindrical, handleless jar, decorated by images of pheasants separated by fir trees. In one grave was a bronze buckle consisting of two heads of lionesses facing each other. This buckle is closely related to some of the Achaemenid objects from Iran. To the same period also belonged some petroglyphs near Aravan and on the Airizmachtaz mountains northwest of Osh. These petroglyphs depicted the silhouettes of local horses of the light Oriental type (*argamaks*), highly praised in Chinese Chronicles of the second century B.C. These are unique representations of the famous Davanian horses.

One rock-drawing, depicting a stag with its head thrown back, is reminiscent of the Siberian representations of this animal. Among individual items of particular interest was a large bronze kettle of Scythian type, with three legs and four discoidal handles bearing figures of mountain goats marching clockwise around the kettle.

A number of settlements found by the Expedition yielded high-grade red pottery, closely related to Kushan ware. The finds from a later period include burials and catacombs accompanied by small copper coins of Chinese type with square perforations, but apparently of Central Asiatic origin.

Among numerous archaic and pre-feudal sites recorded by the Expedition were the ruins of ancient Kasan, located to the north of a modern settlement of the same name and considered to be the capital of Farghana in the eighth century. It was discovered that this settlement was abandoned after the Arab conquest. The ruins of Akhsikath, which was known as the main city of Farghana since the ninth century, showed that it was of considerable extent before the beginning of our era. The lowest cultural strata of the site contained painted pottery. This *gorodishche* was covered by a cultural stratum at the end of the twelfth and the beginning of the thirteenth century. Some fifteenth century objects were found in association with the citadel.

The Expedition succeeded in identifying a series of medieval towns, including Rishtan, currently occupied by a cemetery with a sepulchre bearing the name of the author of Hidaya,[19] a twelfth century lawyer and author. The ruins of the medieval town of Bab, now known as Muncak Tepe, were discovered on the right bank of the Sir Darya. Additional information was gained regarding the topography of the medieval cities of Marghilan and Khokand. It was discovered that at Andidjan, the site occupied by a nineteenth-century mosque

[19] Burkhan al-Din al-Marghinani.

was previously occupied by buildings faced with carved unglazed bricks of the end of the thirteenth to the beginning of the fourteenth century, at which time the town was rebuilt by order of the Mongol rulers, Kaidu and Duwa Khan.

At Kuwa, which during the tenth century was the second largest city of Farghana, the upper cultural stratum of its extensive *shahristan* contained materials of no later date than the beginning of the thirteenth century. Subsequently the population migrated to the east of the original city. Among several hundred coins were the first Bactrian coins to be found in this area, including a chalcous of Heliocles, attributed to the second century B.C. Abundant human skeletal material was excavated.

The members of the architectural group discovered a medieval mihrab covered with magnificent carved clay stuccoes at Ashtsakhob *mazar*, near Osh. Only a few fragments of this type of stucco had been found previously.

In the course of many observations it was deduced that the complicated system of irrigation canals had been built almost two thousand years ago. The main strata of the large castle of Sari-Kurghan (ancient Sokh) nearby yielded pottery of Kushan type. Similar ware was found underneath the modern village of the same name.

The expedition also established that a great part of the sandy desert in central Farghana was cultivated some two thousand years ago and that the ruins of the desert contained many sherds of the Davanian and later types of pottery.

Urals

In 1938 N. A. Prokoshev[20] conducted an archaeological survey along the Viatka river on behalf of the Institute for the History of Material Culture (IIMK). In addition to studying the extensive collections in the local museums, Prokoshev succeeded in examining, partly measuring, and photographing, five *gorodishches* in the Kirov, Sloboda, and Kotel'niki regions (*Raion*) of the Kirov *Oblast*. A brief description of the results follow in the order in which the sites were examined.

1. The *gorodishche* at Nagovitsina (formerly Cherviaki), four kilometres south of Kirov and standing high above the left bank of the Viatka river, is located on the side of a ravine north of the village, and is now overgrown by a coniferous forest. This site was first described

[20] The following summary of results obtained was received through VOKS in a private communication dated 19 August 1939.

by Spitsin,[21] who recorded the smallness of the site and the presence of a disproportionately high earthen rampart of an inverted heart-shape called *kokoshnik*. Spitsin wrote that he was unable to understand the purpose of this type of *gorodishche*. Yet the character of the remains from this site indicates that it had been inhabited. Pottery, animal bones, bone implements, and a copper buckle were found. The rampart, which was built of yellowish sand taken from the shallow and narrow moat on the outer side, was 31.0 by 10.9 by 1.8 metres. The *gorodishche* was oriented in a north-northwesterly direction. The entire surface of the platform and also parts of the rampart were covered with pits dug by treasure hunters.

In the Regional Museum at Kirov are exhibited a series of objects found in this area and presented in 1936 by M. P. Griaznov. The traces of the thin cultural stratum, and the few sherds collected on the surface, indicated to Spitsin that while this site was not suitable for excavation it was important because of the great rarity of *gorodishches* of this period along the middle course of the Viatka river.

The cultural remains leave no doubt that this site belongs to the Anan'ino Epoch. The round-based vessels possessed typical Anan'ino elements of ornamentation such as the impressions of a comb-like stamp, and of a cord. The slip had an admixture of finely-ground shells. This pottery is very similar to that from Galkino *Gorodishche*, located at the mouth of the Chusovaya river.

2. ' Mar'in Kokoshnik ' (' Mary's tiara ') at Chizhi, on the left bank of the Viatka and three kilometres south of Kirov, was first described by Alabin in 1855 and later recorded by Spitsin (*op. cit.* p. 177). Alabin recounts numerous local legends connected with this *gorodishche*. Both authors, however, err in the dating, Alabin attributing it to the earliest Russian settlements in this area and Spitsin considering it to be a later, Votyak, monument.

This site was practically obliterated during the building of a platform for oil tanks. A collection of objects, made at that time, and now in the Regional Museum, consists mainly of potsherds identical with those from the Nagovitsina *gorodishche*. Traces of a cultural stratum were faintly apparent in the denuded places on the slopes. At the foot of the *gorodishche* may be seen the remains of the stratum removed from the platform.

[21] A. A. Spitsin, ' Materials for the Archaeology of the Eastern Provinces of Russia ', fasc. 1, p. 174.

While not suitable for excavation, this *gorodishche* is interesting as a monument of the Anan'ino Epoch.

3. The mouth of the Cheptsa river was first surveyed. A burial ground was examined near Chepets at the confluence of the Viatka and Cheptsa rivers. Iron daggers and ornaments were associated with the human skeletons. Local natives did not know of any stone implements from this place although some have been preserved in local museums.

Objects of Anan'ino culture in the Kirov Regional Museum, collected by P. Shatilov during 1928, came from a *gorodishche* between Krivobor'e and Gorodniki. This site, recorded by A. A. Spitsin (*loc. cit.* I, p. 175), is probably the farthest site to the northeast in the Viatka basin.

At Nikul'chino, fourteen kilometres east of Kirov, were located the remains of a strong earthen fortification with high ramparts forming an irregular rectangle. In the centre of the *gorodishche* stood a stone church surrounded by a low rampart. A. A. Spitsin thought that there were two sites : the outer Russian, more extensive and with higher ramparts ; and the inner, more ancient, in the centre of the *gorodishche* on the site of the church, and belonging to a pre-Russian site. In the denuded spots along the shore of the river may be seen the remains of fireplaces, silvery-grey old Russian pottery and bones of animals.

According to local historians, Nikulitskoe *gorodishche* may be the last remnant of the town of Nikulitsin, established by the Novgorod people somewhat earlier than Kirov and founded during the twelfth century under the name of Khlynov.

4. The *gorodishches* at Kovrovo and Shabalino, described by Spitsin (*loc. cit.* pp. 170–171), are located near the mouth of the Molom river, seven kilometres from Kotel'nich. No new finds have been made recently except that burial grounds, attributed to the fifteenth and sixteenth centuries, have yielded ear-rings and crosses.

At Kovrovo *gorodishche* three types of sherds have been collected :

(*a*) hand-made black with admixture of ground shells ;

(*b*) hand-made red without admixture, called ' Bulgarian ' ;

(*c*) black or silvery-grey, wheel-made, known as ' Russian '.

Many animal bones were also unearthed. The rampart was still well-preserved.

The *gorodishche* at Shabalino had very massive fortifications, reminiscent of the earthworks of Nikulitskoe *gorodishche*. The rampart was exceedingly massive and had a peculiar ground-plan not known

from other early *gorodishches*. Fragments of old Russian 'silvery-grey' pottery were strewn along the shore; no older type of pottery was found.

Prokoshev, who found that the natives were not aware of any finds of stone implements—although the earlier sources mentioned their presence—explains their absence thus:

(*a*) flints had been used widely for fire-making until about fifty years ago, and the peasants may have systematically collected all stone implements for use in tinder boxes;

(*b*) stone arrowheads, regarded formerly by the peasants as possessing curative property are no longer used, and consequently the peasants are no longer interested in looking for them.

Altai Region. The stone mound at Pazyryk in the eastern Altai was opened during 1929 by M. Griaznov, of the State Ethnographical Museum in Leningrad, but many of the objects, now in the Hermitage Museum, remain unpublished.[22]

The mortuary chamber of the tomb was a feat of engineering for people who had only bronze tools. The inner vault of thick planks was enclosed in a log cabin. The space between was packed with crushed stone. The pit was covered by three hundred logs resting upon massive beams.

Through a shaft, robbers had pillaged the contents of the vault, including the skeleton—presumably for its vestments. An Altai funeral garment from Katanda, recently restored in the State Historical Museum at Moscow, consisted of three thousand pieces of ermine dyed red and green, fitted in a fish-scale pattern, lined with sable, and decorated with eight thousand miniature carved gilt buttons.

The grave-furniture consisted of scraps of gold leaf, a small leather carving, pieces of felt hangings and the sarcophagus. The wall covering, fastened by copper nails with gilt heads, was black with a white border decorated with blue, yellow, and red festoons and set with conventionalized red and blue tiger-heads. Wooden pegs indicated that mortuary gifts were hung on the walls.

The sarcophagus, hollowed out of larchwood logs, was covered with

[22] See 'The Pazirik Burial of Altai', by M. P. Griaznov and Eugene A. Golomshtok, *American Journal of Archaeology*, xxxvii, No. 1, pp. 30–45 and pls. i–vi, 1933; M. Griaznov, '*Pazyrykskiĭ Kurgan*', Academy of Sciences of the U.S.S.R. and Hermitage Museum, Leningrad, 1937. [Summary in French]; and H. Field and E. Prostov, 'Soviet Archaeology Today–ii', *Asia*, xl, p. 330, 1940. Despite the descriptions previously published on the Pazyryk finds these notes, received from Leningrad during 1940, bring the results up to date.

shiny brown strips of bark of bird-cherry. The sides bore silvered leather appliquées of stylized birds.

The most important finds included carcases of horses and their trappings. The horses were well-groomed, with closely-clipped manes, forelocks, and tails. The ears were notched in various ways to indicate ownership ; they had been donated by ten different owners. Ten decorated sets of saddles and bridles and two equine masks had been flung on top of the carcases. There were also shields of rods and leather, a whip with a wooden handle, and a pouch of lynx fur filled with herbs. The decorations of the trappings were of wood attached with merely a few stitches and intended for ceremonial use.

The saddles and bridles were of the usual design of the period (about 350 B.C.), hitherto known only from representations on Scythian vases and on rare bone and bronze fragments. The saddle, which consisted of two leather pillows stuffed with deer's wool and without either a hard seat or stirrups, was kept in place by a surcingle, a breast band, and a breeching strap. The bridles were decorated with gilt or silver pendants of cedar and buckles with animal figures, occasionally with human effigies, and with imitations of scalps. The coloured felt saddle-covers had appliqué designs of felt or leather, and pendants of felt, leather, dyed fur, and horsehair. The masks were made of thick felt and leather. The nose of the reindeer mask was in the form of a tiger of bright blue fur, set with gold discs ; the remainder was coloured leather with golden leaf in rosette openings. The antlers were of thick leather covered by thinner leather with ornamental openings, and tipped with red horsehair tassels. The second mask depicted the struggle between a horned winged feline and a tiger. The head and wings were of leather of several colours surmounted by a red horsehair mane. The reindeer mask is regarded as a survival of funeral rites of the period preceding the appearance of the horse.

The artistic execution of these objects is of a very high order. More than two hundred carvings on buckles and clasps represented animals, heads of animals, and combinations of ornamental motifs resembling plant-ornaments, but derived from parts of animals, which also appeared on saddles and straps. Of particular interest were the bit ornaments in the form of galloping deer, argali and other animals.

The artistic motifs from Pazyryk range from extremely stylized renderings to naturalistic portrayals of animals. In addition to elk, deer, argali, bezoar, and tiger, appear such fantastic creatures as a winged tiger either with a tail terminating in a bird's head or with a vulture's beak and antelope horns, and many others.

No other Scythian or Siberian culture shows such a variety of ornamentation. At least eighty pictorial and ornamental motifs were used by Pazyryk craftsmen.

Other interesting subjects were the fighting animals on the saddle covers ; carvings of a tiger tearing the throat of an argali, or another tiger tearing the croup of an elk, representations of fish or a dragon with the head of an argali in its teeth ; an immense bird of prey bearing an elk in its talons, or a winged tiger holding a mountain goat by its leg and withers. Because of the fantastic nature of the subjects these representations could hardly be the mere products of artistic imagination, but rather vestiges of totemism or symbols of cosmic or religious concepts.

Every animal motif from Pazyryk *kurgan* has its counterpart in widely separated sites ranging from Asia to eastern Europe. According to the Soviet archaeologists the ' Scytho–Siberian animal style ' is neither unique nor does it spring from a single source, but rather has it developed from the common economic and social bases of different cultures.

According to Griaznov, however, the art of the Altai region was completely local, not having come from outside sources and not having served as a fountain-head for other regions. At the same time the dwellers in the Altai readily adopted any artistic motif which came from a similar cultural group. Thus, similarities between the finds at Pazyryk and the art of Achaemenid Iran can be explained.

SUMMARY

This report gives in brief some of the results obtained by Soviet archaeologists during 1939–1940. The authors wish to express their gratitude to the Director of the Institute for the History of Material Culture (IIMK, formerly GAIMK) in Leningrad who submitted the report from which this paper was largely written.[23]

From information received during October numerous archaeological units are now at work in many areas of the Soviet Union. In a recent conversation Dr Ales Hrdlicka informed us that during his visit to the U.S.S.R. in the summer of 1939 he was particularly impressed with the standard of technique observed during excavations in Siberia. It is some slight consolation to know that even at this time archaeological researches are still in progress in the northern part of the Eurasiatic continent.

[23] Miss Dorothy Pedersen assisted with the editorial revision of the original text.

Notes and News

THE DISTRIBUTION OF CURRENCY BARS

It is well known that currency bars are almost entirely confined to the region of the Early Iron Age B (southwestern) culture, and it is generally held that the majority of these bars were made of Forest of Dean iron.[1] The richness and accessibility[2] of the iron ores of the Forest, and the evidence for a considerable population on the flanks of the lower Severn Valley,[3] make this view probable, but no conclusive metallurgical evidence of such derivation for any currency bar has been adduced.[4] The distributional evidence bearing on the problem has never been adequately studied, the interest of scholars having been almost exclusively centred on Reginald Smith's thesis, now generally accepted, that the bars were used as currency, and indeed manufactured for that purpose.[5]

The following notes, accompanying a map, a diagram and a revised list of sites, will deal with currency bars geographically and quantitatively, with a view to determining the weight of the evidence in favour of Forest of Dean origin. The list provides seven sites

[1] The references to the Forest of Dean in the literature are for the most part incidental, e.g. E. T. Leeds, ' Excavations at Chun Castle ', *Archaeologia*, 76, p. 237, and E. Wyndham Hulme, ' Currency Bars and Water-Clocks ', ANTIQUITY, 1933, p. 61.

[2] On this see *Antiq. Journ.*, 1939, XIX, 387, and figs. 9–10.

[3] Contrast the *relative* density of finds and sites of the Bronze Age in this district with that of Iron Age B finds and sites. *Personality of Britain*, 3rd ed., map C, and fig. 11a.

[4] Professor Gowland made a ' chemical and microscopic examination ' of two currency bars submitted to him in 1904, provenance not stated. He reported that Bar A was ' apparently made from meteoric iron ', the use of which, he adds, must have been quite exceptional. Bar B, on the other hand, was ' forged from a bloom or lump of malleable iron '. He regarded it as difficult to speak with certainty of the source of the ore of bar B, but was ' inclined to believe it was the Forest of Dean and not the Weald '. *Proc. Soc. Ant.*, 1904–5, ser. 2, XX, 194.

The possibility of determining the source of the bars on the basis of spectrographic analysis of likely ores is being investigated by my colleague Dr F. J. North, but it has not, in present circumstances, been convenient to collect the necessary ores.

[5] The only distribution-map (other than sketch maps) is that prepared by Mr H. St. G. Gray and published in *The Glastonbury Lake Village*, vol. II, p. 399, and this makes no distinction between single finds and hoards. Mr Gray publishes an annotated list of sites with this map, based on those published by R. A. Smith in his classic series of papers in *Proc. Soc. Ant.*, ser. 2, XX, 179 ff., XXII, 377 ff., and XXVII, 69 ff.; also *Arch. Journ.*, LXIX, 421 ff. But both authors treat the problem of distribution in less detail than it seems to me to merit.

additional to those recorded in earlier lists :—Sudeley Castle, Glos. (doubtful); Kingsdown Camp, Mells, Somerset; the river Thames at Marlow, at Datchet, and at Hammersmith; Burton Latimer, Northants.; and Settle, Yorks. The Bourton on the Water hoards (hitherto deduced as two, from obscure records) have been reduced to one.[6] One site is omitted : Wayland's Smithy, Berks.

On the map a find of from one to five bars is shown by a dot; a dotted circle indicates more important finds which can properly be described as hoards.

It will be seen that there are two concentrations, in addition to scattered finds; one in the Dorset–Somerset region, and one in the Malvern Hills–Cotswold district. The former is where one would expect currency to have been wanted by the Iron Age B people, namely in a rich and populous centre of their culture, near Poole Harbour, a focus of their continental trade.[7] But until currency bars are found in Brittany, the latter point must not be pressed.

Though no currency bar has been found in the Forest of Dean the existence of the Malvern–Cotswold concentration points to this ore-field as the chief source of supply. Such a concentration is most easily explained as representing important centres of the folk who controlled the mines; and the induction is rendered still more probable when the distribution of currency bars is considered quantitatively. Hoards of currency bars run up to hundreds, the largest containing 394; all such are in the Malvern–Cotswold region. In other words, if we confined the hoard symbol on our map to aggregates of a hundred or more—which is no more and no less arbitrary than the selection of 'over 5' as justifying that symbol—there would be four hoards and four only on the map : and all of these in the Malvern–Cotswold region.

The important corollary to such a re-assessment is that the southern group would fall into place with the isolated finds on the map, as peripheral and secondary, and therefore of minor importance from our standpoint.

For the weight of concentration in the northern area to be grasped graphic presentation is necessary; and the diagram has been constructed accordingly. The vertical bars represent units of currency; the horizontal spacing represents units of distance (miles) from

[6] Miss L. F. Chitty, F.S.A., Mrs E. M. Clifford, and Mrs B. H. St. J. O'Neil, have kindly helped me with these additions and modification.

[7] J. P. Bushe-Fox, *Hengistbury*, Research Rep. Soc. Ant., 1915, no. III, pp. 8–10.

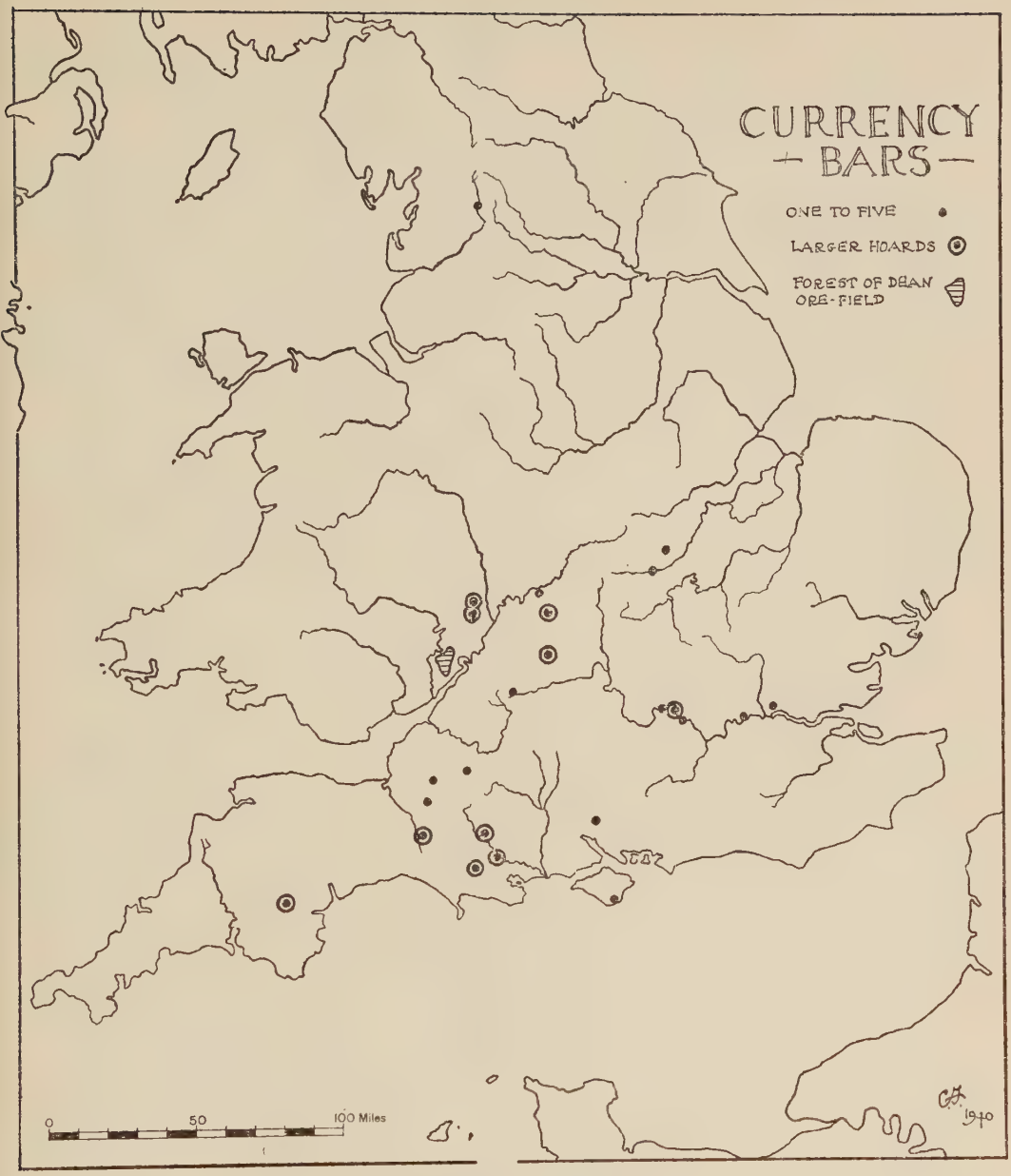

FIG. 1. THE DISTRIBUTION OF CURRENCY BARS

Cinderford, centrally situated on the eastern outcrop of iron ore deposits in the Forest.[8]

The three tall black bars on the left of the graph represent mainly the two Malvern hoards, the Meon Hill and the Bourton on the Water hoards, all within between 21 and 39 miles from the ore-field. The bar immediately beyond these mainly represents the Ham Hill (Somerset) find ; all the others are negligible numerically. Put in another way : the total number of currency bars known is $997+x$ (see list). Of these $840+x$, or 84.3 per cent., come from sites within a radius of 40 miles of the Forest of Dean, all the more important of these being grouped to the north and east of the Forest. The remainder of the finds, totalling about 157, and representing 15.7 per cent. of the whole, is sited at various points from 41 to 164 miles from this centre.

It is recognized by students of distribution-maps of chance finds that no pattern is free from error, and that no matter how numerous the site-marks may be, caution in interpretation is essential. In the case of currency bars this caveat is very necessary, for the finds are comparatively few. But it is no less a matter of experience that when a very marked and definite trend is demonstrable in a distribution-pattern, later discoveries (or additions gleaned from a scattered literature) seldom neutralize that trend.

It may provisionally be concluded then, that the Forest of Dean was the principal source of the ore for currency bars ; that the hoard sites to the north and east of the Forest represent the centres of population, mostly fortified, of the controlling tribe or groups. That these centres were so far from the ore-field is a curious fact. It seems likely that the manufacture of the bars was carried out thereabouts, and not in the Forest. The Forest region would certainly be unattractive to ruling clans who were mainly pastoralists or agriculturists, though there are considerable areas of country, originally fairly open, with well-drained and fertile soil nearer than the 20 miles of the Malvern or the 30–40 miles of the Cotswold countrysides. In attempting interpretation, we are, of course, faced with completely unknown political factors. The controlling groups were probably elements of the Dobuni ; had the influence of the Silures—centred somewhere near Caerleon, Monmouthshire—extended into the Forest, currency bars would surely have turned up in the camps on the limestones bordering the lower Wye or on the South Wales littoral.

[8] See a recent geological map of the Forest of Dean, published in *Antiq. Journ.*, 1939, XIX, p. 388, fig. 9.

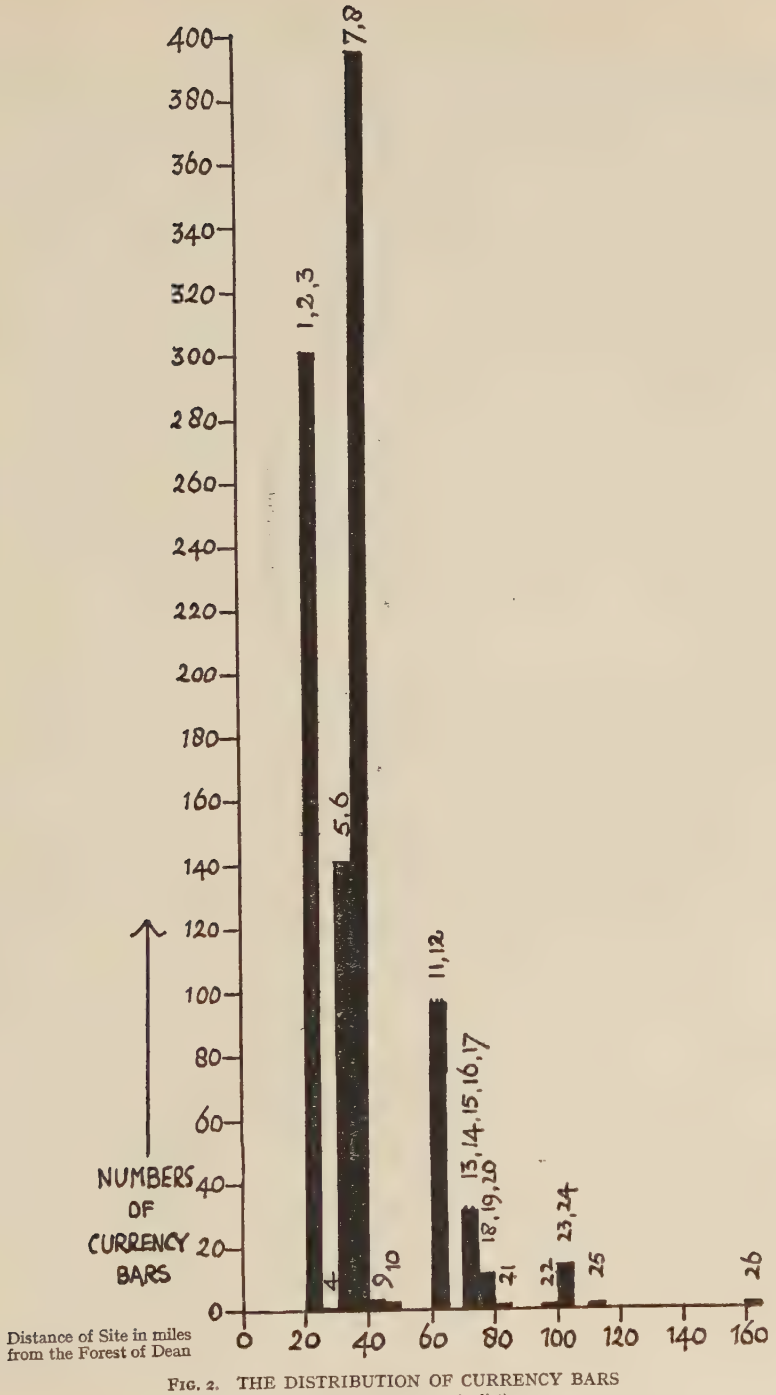

FIG. 2. THE DISTRIBUTION OF CURRENCY BARS
(The numbers refer to the list)

SITES YIELDING CURRENCY BARS, ARRANGED ACCORDING TO DISTANCE FROM THE FOREST OF DEAN[9]

Reference No.	Site	Chief References	No. of Bars	Miles from Cinderford
1	Malvern, Worcs.	*P.S.A.*, xx, 183–4 and xxii, 340	150	21
2	Malvern, Worcs.	*P.S.A.*, xx, 183–4 and xxii, 340[10]	150	21
3	Sudeley, Glos.	Inf. Mrs E. M. Clifford[11]	2	25
4	Minety, Wilts.	*Glastonbury*, ii, 402	1	27
5	Salmonsbury Camp, Bourton on the Water, Glos.	*P.S.A.*, xxvii, 69–71, and information from Mrs O'Neil[12]	*c.* 140	33½
6	Littleton, Worcs.	*P.S.A.*, xxii, 340	1	33½
7	Meon Hill, Glos.	*P.S.A.*, xx, 183, and xxii, 337–40, and *Glastonbury*, ii, 402	394	38½
8	Kingsdown Camp, Mells, Som.	*Archaeologia*, lxxx, 87	2	40
9	Wookey Hole, Som.	*Glastonbury*, ii, 400	3	41½
10	Glastonbury, Som.	*Glastonbury*, ii, 395–6	2	47
11	Ham Hill or Hamdon, Som.	*Arch. Journ.*, i, 165; *P.S.A.*, xx, 183; *Glastonbury*, ii, 399–400	70–80	61
12	Hod Hill, Dorset	*P.S.A.*, xx, 182; *Glastonbury*, ii, 401	17+	65
13	Spettisbury, Dorset	*P.S.A.*, xx, 182–3	5+	71
14	Milborne St. Andrew, Dorset	*Glastonbury*, ii, 401	18+	72
15	Thames at Marlow, Bucks.	*Arch. Journ.*, lxxxvi, 74	2	72
16	Winchester, Hants.	*P.S.A.*, xx, 183	4	73
17	Hunsbury, Northants.	*Arch. Journ.*, lxix, 422, and xciii, 67	2	73
18	Thames at Maidenhead, Berks.	*P.S.A.*, xx, 184	7–8	80
19	Thames, Berks.	*P.S.A.*, xxii, 341–2	1	80 (?)
20	Thames at Datchet, Bucks.	*Arch. Journ.*, lxxxvi, 74[13]	2	80
21	Burton Latimer, Northants.	Inf. R. W. Brown, Esq., Northampton Museum	1	83
22	Thames at Hammersmith	*Arch. Journ.*, lxxxvi, 88	1	98
23	Holne Chase, Devon	*P.S.A.*, xxii, 341; *Glastonbury*, ii, 401	12	102
24	St. Lawrence, Ventnor, I. of W.	*P.S.A.*, viii, 312–13; *Glastonbury*, ii, 403	2	102
25	East Ham, Essex	*Glastonbury*, ii, 403	1	111
26	Settle, Yorks.	*Ant. Journ.*, xix, 90	1	164

notes see page 433

CYRIL FOX.

Notes for page 432

[9] Based on R. A. Smith's list in *Proc. Soc. Ant.*, ser. 2, xx, pp. 184–5, and H. St. G. Gray's list in *The Glastonbury Lake Village*, II, 398. All references to the *Proc. Soc. Ant.* are to volumes in the second series.

Two ' currency bars ' are recorded from Wayland's Smithy, Berkshire (*Ant. Journ.*, 1921, I, p. 188). Recent re-examination in the Department of British and Medieval Antiquities, and in the research Laboratory of the British Museum has however shown, as I am enabled to state by courtesy of the Keeper, that the currency bars discovered in the course of the excavation of this site, are in fact blacksmith's ironwork very unlikely to be older than the 18th century. They are probably the two halves of a single object, their narrow ends having been united in a forged joint. These objects are therefore omitted from my list.

[10] ' In the following year a second deposit of 150 bars was found three or four yards further up the hill '. (*Proc. Soc. Ant.* xx, 183).

[11] Antiquities found on the Sudeley Castle estate have for many years been preserved at Sudeley Castle, see *Ant. Journ.*, xvii, p. 446 and xviii, pp. 75–6, for published examples. Two currency bars are in the collection. While it is by no means improbable that these were found in the parish, the fact that Salmonsbury is less than ten miles away from Sudeley, and that of the 140 bars found in 1880 the location of 40 only is known, demands caution.

[12] Currency bars from Salmonsbury, Bourton on the Water, Gloucestershire. Mrs O'Neil kindly provides the following record :—The following information about the currency bars found in Salmonsbury has been collected first hand by myself during 1931–34, from J. C. Milton, the son of the man who found and dug up the bars and from two old inhabitants of Bourton who were present when the find was made and who watched the proceedings.

' The history of the find is, that due to the burning down (in 1880) of the farm barn that stands in the centre of the camp, gravel was needed for the work of rebuilding. This was dug and brought from the inner slope of the inner northern rampart of the camp, a distance of two fields away. While digging the gravel the currency bars were found by Milton, about 140 packed close together, socket to point, giving the impression that they had been contained in a chest. Human remains were found with them. The bars aroused much curiosity and when dug up were placed in a wheelbarrow and taken to the local blacksmith who was anxious to test them by smelting some down ; others were taken as curios by Mr G. Moore and the remainder disappeared. Some forty years later a rusty heap of the bars was found by Sir Walter Essex in a shed of the house (now Grey Gables) belonging to the owner of the camp in 1880.

' I can find no evidence whatsoever for two hoards in Salmonsbury.

' Mr Dunning has made a record with drawings of any bars that can still be traced, which I am sorry to say only number 40 '.

[13] I equate these with the two bars in the London Museum from ' near London '.

MADRAS CATAMARANS

I have to thank Mr R. Jackson for drawing my attention to the need to clarify the meaning of a sentence in my paper on the 'Origins of Plank-built Boats', published in ANTIQUITY, March 1939. In this, after describing the sailing catamaran of Vizagapatam, I remarked that 'the more primitive type seen at Madras never sets any kind of sail'. For 'more' the word 'most' would have been preferable and subject to no misapprehension of meaning.

I should here explain that the most primitive type of catamaran used by Madras fishermen is that employed for line fishing and known as the *thundil maram* or hook-catamaran. In it all the refinements of construction and equipment common to the catamarans used by net fishermen are wanting and a sail is *never* used. In the net-fishing catamarans—the *periya maram* and the *irukka maram*—a small lateen sail is set whenever there is a favourable wind. Full details of the equipment of these superior types of sailing catamarans are given in my memoir on 'The Origins and Ethnological Significance of Indian Boat Designs', published in vol. VII of the *Memoirs of the Asiatic Society of Bengal.*

JAMES HORNELL.

A VIKING SHIP-BURIAL AT STRANRAER?

The possibility that a Viking ship-burial may have been partially uncovered at Stranraer, probably in 1683, is suggested by the following extract from *A Large Description of Galloway*, by Andrew Symson, a Scottish Episcopal minister of the late 17th century.*

'In this town [Stranraer] the last year, while they were digging a water-gate for a mill, they lighted upon a ship, a considerable distance from the shore, unto which the sea at the highest spring-tide never comes. It was transversely under a little bourne, and wholly covered with earth a considerable depth; for there was a good yard, with kale growing in it, upon the one end of it. By that part of it which was gotten out, my informers, who saw it, conjecture that the vessel had been pretty large; they also tell me, that the boards were not joyn'd together, after the usual fashion of our present ships or barks, as also that it had nailes of copper'.

E. CECIL CURWEN.

* This work was compiled in 1684, completed in 1692, but not printed till 1823. It may be found in the appendix to the second volume of Mackenzie's *History of Galloway*, and in the *Geographical Collections relating to Scotland made by Walter Macfarlane*, published by the Scottish Historical Society. The extract here given is as quoted by Rev. C. H. Dick in *Highways and Byways in Galloway and Carrick* (edn. 1919), p. 294.

THE WHITE PATINATION OF BLACK FLINT (PLATE)

The change of surface-colour to which flint is liable under certain conditions is a commonplace of archaeology. A knowledge of the nature of this change, and of the factors to which it may be due, may, however, be of great value in assessing the history of a flint implement and the possible changes of environment which it may have undergone since it was originally struck.

The writer makes no claim to have studied this subject comprehensively, but feels that it may be worth while recording certain observations and experiments that bear on the question.

In excavating the shaft of a neolithic flint-mine, as for instance on the Sussex Downs, where freshly fractured flint appears black, the rule is that the degree of patination exhibited by flakes and implements found in the filling of the shaft varies inversely with the depth at which they are found. Thus flints found in the mould overlying the chalk filling show a dense, opaque white surface, with blunt edges, and even patches of surface disintegration. An implement presenting these features can always be recognized as a surface find. Flints found in the upper part of the chalk filling show a creamy white patina, but have fairly sharp edges. The lower one goes the thinner and more translucent is the white film that covers the black flint below it, appearing first like spilt milk, and then as a mottled blue and white. At a depth of about 9 ft. this gradually gives place to a mottled blue and black, while below 15 ft., and in the galleries, the patination is so slight that it only becomes apparent on drying, and may be said to be virtually absent. It is also commonly observed that in some cases the upper surface of a flint as it lies in the chalk is patinated to a greater degree than the lower. These observations point to the fact that the patinating agency, whatever it be, descends from above, attaining its greatest concentration in the surface mould. One may infer, too, that when the relationship between degree of patination and level of find-spot is observed to hold good, all the flint implements and flakes in the shaft must be contemporary with the mining.

This white patination is a physiochemical change that affects the surface as a result of solvent action. Flint consists of an extremely fine sponge-like meshwork of chalcedony, the interstices of which are filled with opal, these minerals consisting of silica in crystalline and colloidal forms, respectively.[1] If the opal is dissolved out by a solvent,

[1] For a recent review of the nature and origin of flint see Dr K. P. Oakley's paper in *Science Progress*, XXXIV (Oct. 1939), 277.

leaving only the meshwork of chalcedony, the latter appears white, just as foam appears white, because it is a meshwork of water containing minute air-spaces. This white patination can be produced artificially by boiling a piece of black flint in a weak solution of caustic soda ; prolonged boiling goes further, and produces gross disintegration of the surface by attacking the framework of chalcedony—thus reproducing the disintegration observed in some surface flints.

Surface flints, however, that are found in mould overlying non-calcareous sub-soils, such as sand or clay, rarely show more than the feeblest trace of patination, and are as a rule virtually unpatinated. The inference from these combined observations is that whatever the actual solvent responsible for the phenomenon may be, the presence of *both* surface-mould *and* chalk (or other calcareous matter) is necessary. In other words the solvent is the product of something in the mould acting on the chalk, and this something is, according to Dr Oakley, carbonic acid in the ionized state.

Before his paper appeared I undertook a few experiments with the help of Mr D. W. Hudson, in order to determine the nature of the solvent, but without conclusive results. We did, however, obtain positive confirmation of the view put forward above that mould (or at least decaying organic matter) *plus* chalk are necessary for patination to occur.

The experiments consisted in the prolonged immersion of freshly struck flakes of black flint (from Brandon) in various solutions or suspensions at room-temperature.

Flakes were immersed in the following mixtures for a period of 1 year and 10 months :—(1) chalk and water ; (2) chalk and water containing decaying grass, animal urine and garden mould. When examined and dried the first group was found to be quite unaltered, but the second exhibited well marked patination at the points of contact with the chalk,[2] and a slight ' bloom ' over the rest of the surfaces immersed. This indicates that the solvent was given off from the chalk under the influence of something in the decaying organic matter. The thickness of the patina in this group was determined as lying between 1/200 and 1/100 millimetre (PLATE facing).

Other flakes were immersed in the following solutions for a period of $2\frac{3}{4}$ years :—(3) ammonium carbonate with chalk ; (4) ammonium

[2] And also incrustations, insoluble in hydrochloric acid, and therefore probably consisting of calcium silicate.

EXPERIMENTS IN THE PATINATION OF BLACK FLINT

1, 2. Unpatinated black flakes

3–5. Patination produced by prolonged immersion in a suspension of chalk and decaying organic matter
3 shows patch of incrustation of calcium silicate (?) at point of contact with lump of chalk
4 broken across to determine depth of patination

facing p. 436

carbonate ; (5) calcium hydrate ; (6) ammonium hydrate. None of these showed any trace of patination.

Finally two flakes were immersed in a solution of carbon dioxide in water, under pressure in a sparklet syphon for nearly four years, with entirely negative results.

The importance of understanding the nature of patination and the factors giving rise to it lie, as has been said, in the clues it may give as to the vicissitudes through which a flint flake or implement may have been since it was first struck. Besides indicating the contemporaneity of flints in the shaft of a flint-mine or other deep excavation in the chalk, patination may give clues in some such way as the following : an abnormal degree of patination on a flint found above a sandy subsoil suggests that the specimen in question may have been brought from the chalk Downs as material for re-use ; indeed it may even show unpatinated secondary working. In such a case the flint must be supposed to have been lying on the chalk Downs long enough to acquire its patina before being collected for re-use. E. Cecil Curwen.

THE TREASURY OF ATREUS

In our September number a reference was given to the plan of the Treasury of Atreus mentioned by Mr A. J. B. Wace in his article (pp. 233–49). We had hoped to reproduce the plan published as plate LVI in the 'Annual of the British School at Athens', XXV (pp. 504, 73 plates, 98 text-figures) which consists of the full reports of the excavations undertaken by the School at Mycenae, 1921–23. Circumstances prevented, and the deletion of the reference to the plan (page 234, line 7) was overlooked.

Reviews

MINING AND METALLURGY IN NEGRO AFRICA. *By* WALTER CLINE. *Menasha, Wisconsin, U.S.A. George Banta Publishing Company,* 1937. *pp.* 155, 16 *illustrations*, 4 *maps.* $2.00.

Among the innumerable books which have been written upon African exploration there are to be found many accounts of the technical processes employed by the skilled craftsmen of that vast continent. The author of this book has endeavoured to assemble within its covers all accessible data upon mining and metallurgy. His task therefore was mainly a bibliographical one, but he brought to it a keen sense of ordered discrimination and technical curiosity. He has built up a useful source-book for those who wish to make more detailed studies, and, in particular, he has collected valuable material for comparison with those primitive processes of mining and metal-working in other lands, which are of such perennial interest to archaeologists.

As its title suggests, the countries of Egypt and of the Mediterranean coast lie beyond the geographical limits of the book. In passing, it is interesting to note how little the high technical and artistic culture of the Egyptian court spread to Nubia or the other countries to the south and west. It would seem that a series of military raids, with some semi-permanent occupation, to enforce a tribute of gold, slaves, and other plunder, rather than the peaceful penetration of mutual trade, represented Egypt's sole interests in these lands.

Much of Egypt's early gold came down the Upper Nile and from the land of Punt, now generally identified with the Somali coast. But it was from West Africa, the Western Sudan and the Sahara that the great bulk of medieval trade in gold proceeded : Arab, Italian and Portuguese traders were concerned in this. Much of the gold was from alluvial washings, but some shallow mining seems to have been practised. The natives valued gold principally as a means of foreign trade : copper, brass, iron, and woven fabrics were sought in exchange. In the Middle Ages there was great gold mining activity in the Transvaal and Southern Rhodesia, and a smaller amount in Central and East Africa. Silver was little known or worked.

The earliest datable iron ornaments and implements from Africa are a few predynastic ornaments and tools from Egypt, made from meteoric iron ; and, much later, the wrought iron head-rest and tools from the tomb of Tutankhamen. Nothing so early as this has been found in Negro Africa, but iron remains

associated with neolithic sites are to be found in the Niger region and from at least one site in South Africa. From the 8th century A.D. onwards the iron workings of Zimbabwe were of importance, and the trade in iron from South and East Africa eventually extended to India and the Far East.

Types of furnace employed in smelting the ore vary considerably. The author describes them in detail and gives a number of drawings of the furnaces built by different tribes. They range from a small open hearth to the great furnaces of the Western Sudan, which sometimes reach eight feet in diameter and twenty feet in height. The smelted iron from these furnaces differs much in quality : the bloom from the smaller furnaces and hearths containing a high percentage of slag and carbon, while those from the tall furnaces are of almost pure wrought iron.

The ancient copper and tin mining industry of South Africa was extensive, but there is uncertainty as to its actual antiquity. Some of the mines, however, are at least several hundred years old. Individual workings may be as much as 150 feet deep, and must have produced ore equivalent to a thousand tons of copper. The production and export across the Indian Ocean of copper, and perhaps bronze, from the Zimbabwe region may, indeed, be as old as its trade in iron. In Africa, tin mines seem only to be found in the Transvaal and in Northern Nigeria.

The author discusses the distribution of copper workings and the methods of copper smelting at length. The negroes never mined zinc or lead, so a European or Arab source must be found for all brasses. These alloys were brought to the Niger and Guinea by Arabs and Moors, and by European traders at the coast. The Moslem invasion would bring them to the Central Sudan. The well-known ornamental castings from Benin, of brass rather than bronze, may be composed of copper from the Sahara or the Southern Congo, and zinc perhaps of Iberian origin, for some of the casts contain traces of arsenic, antimony and nickel.

Casting in the open mould, rod casting and the *cire perdue* processes are discussed in turn. A characteristic feature of the West African *cire perdue* technique is that after the clay mould has been formed over the wax model a clay crucible, filled with the brass which is to be used in the casting, is luted with clay to the upper end of the mould. When thoroughly dried, the combined crucible and mould are placed in the furnace with the crucible downwards. The wax is melted out through a hole left for the purpose. The fire is increased to melt the brass, and, when the craftsman considers that fusion is complete he reverses the position of the mould, thus allowing the molten metal to flow into it. It would seem probable that the art of *cire perdue* casting was introduced to West Africa from the Sudan and that the method had its origin yet further north.

The technique and equipment of the forge are dealt with at length ; and the varied types of drum, concertina, and bag bellows are illustrated fully. A discussion of the methods of wire-drawing, and the making of metal ribbon and of chain follows.

A long chapter on the social and religious aspects of metal working shows in how intimate a fashion the successful work of the craftsman is felt to depend upon the favour of the powers above him. The operations of the smith's craft are closely bound up with ritual inhibitions and magic.

A chapter entitled ' Speculations ' enables the author to set down a few guesses as to the routes by which the knowledge of metallurgy spread throughout the continent, and a bibliography of over 300 works, with a few maps, concludes this very useful book. HERBERT MARYON.

NORDISK KULTUR II. Befolkning under Medeltiden. Utgiven af ADOLF SCHÜCK. *Stockholm, Bonnier ; Oslo, Aschehoug and Co. ; Copenhagen, Schultz*, 1938. *pp.* 180. *Kr.* 7.

This volume of *Nordisk Kultur* contains four articles—Denmark's population and settlements in the Middle Ages, by Aksel E. Christensen ; the People of Norway in the Middle Ages, by Oscar A. Johnsen ; Swedes in Finland and Esthonia, by Eirik Hornberg; and the history of Sweden's population during the Middle Ages, by the editor of the volume.

Denmark, much more than the other Scandinavian countries, has remained an ethnic unity since prehistoric times, and in consequence of that fact Herr Christensen is able to devote much of his space to a discussion of the various strata of settlements within the country, and to show how a lightly populated, heavily wooded countryside has changed in character. From the ethnic point of view, study of modern Danish dialects is of little help, since the Danish dialects exemplify the simplest method of formation, by geographical remoteness ; and there being likewise little archaeological evidence for the period, the author relies largely upon place-names. Special note should be made at this point of the lists of place-name elements and the distribution-maps given; they are of particular interest and value to the student of English as well as of Scandinavian place-names, since many of the Danish elements also figured in the Danelaw.

In the second part of the article we come to the question of emigration and immigration. Emigration is comparatively simply disposed of for the early Middle Ages, consisting as it did of extensive transference of population to England and other countries during the Viking Age ; at a later period it was not the emigration of communities so much as of individuals or groups—nobles, churchmen, or merchants. Immigration is more fascinating, since we learn of small ' pockets ' of settlers—Swedes in Sleswig-Holstein, Frisians, Wends,

Germans ; and it is interesting to note that the German immigrants, largely connected with trading and with the Hanseatic League, occupied in Denmark positions of importance quite disproportionate to their numbers. That last fact, along with the crushing effect of the Black Death in the middle of the fourteenth century, is a feature of all the Scandinavian countries, and is repeated in two other articles. The Black Death clearly was a catastrophe which has left the Scandinavian countries under-populated to this day.

In the earliest literature of Norway it is stated that there were then, as at present, two ethnic groups, one of tall fair people, the others short and dark, and the latter perhaps the older strain in the country. Herr Johnsen's article, like the previous one, deals with Viking emigration and with the evidence of place-names, and many features are obviously common to Denmark and to Norway. An increasing move towards the towns brought immigration, mostly of traders and clergy, and at a later date of nobles from Denmark ; but again trade and population dwindled with the Black Death, and it was only with the increasing importance of the timber trade that Norway slowly began to recover.

Herr Schück's approach to his study of Sweden is necessarily different from those of the other writers. To begin with, Sweden was not an ethnic unity such as Denmark, nor a political one as Norway was *in posse*, if not *in esse*. Accordingly the author is pre-occupied with the ancient territorial divisions of what is now Sweden, and with the need for the identification of the races which occupied that territory. With Swedes and Geats, then, and the extent of their lands, the main part of the article deals. Where such a type of discussion bulks so largely, it is unfortunate that Herr Schück has chosen to adopt the view that the Geats and the Jutes were identical—a view much out of favour among linguistic scholars.

The article on Swedish settlement in Finland and Esthonia has an interest of its own. The main point about this colonizing is that it was essentially popular in its nature ; the colonists were peasants, farmers, and woodmen, and the land on which they had settled had previously been waste. The majority of the settlers came from Norrland, and settled in the south and southwest of Finland, and on the islands and coast of Esthonia. By about A.D. 1560 the number of Swedish settlers in Finland amounted to about 250,000 ; in Esthonia by the end of the 17th century there were 12,000 Swedes. In the latter case, however, the settlers merged with the Esthonian colonies.

One personal grumble. The writers attempt to form estimates about the population of the various Scandinavian countries, based on certain medieval documents—tax rolls and the like—while admitting that the results they give may be quite misleading. Still they continue to give those results, and to base theories upon them. Surely this is special pleading ? ANGUS MACDONALD.

SAINT NINIAN AND THE ORIGINS OF THE CHRISTIAN CHURCH IN SCOTLAND. *By* W. Douglas Simpson. *Oliver and Boyd*, 1940. *pp.* 112, 15 *plates and* 2 *maps.* 10*s.*

This well written, well printed and well illustrated book follows the lines of the former works of Dr Simpson : *The Historical Saint Columba* and *The Celtic Church in Scotland*, which are known to the readers of Antiquity from the reviews in vol. II, 372–5, and vol. IX, 492–4. St. Ninian is 'the first recorded Apostle of the country we now call Scotland ', known principally through a few lines in the Ecclesiastical History of Bede who refers to him side by side with St. Columba, assigning to the latter the conversion of the northern, to the much earlier Ninian that of the southern, Picts. The eighth-century poem on the saint (see my article Antiquity, XIV, 280) was not known to the author; so, besides Bede, he had to use the doubtful ' Life ' which Ailred of Rievaulx composed in the twelfth century, a few other even more doubtful late traditions and such further information as might be gained from the interpretation of church dedications and archaeological evidence. He relies upon Ailred's tale of Ninian's relations with St. Martin of Tours (which, judging from the silence of the poem, must now be considered worthless) ; so he accepts, like many predecessors, the year of Martin's death, 397, as the one fixed date of Ninian's life (the ' sixteen years ' given on p. 63 from Sulpicius Severus conflict with this date), and on this shaky foundation he attempts ' to reconstruct the historical background and to assess the achievement of St. Ninian '. He emphasizes the Roman influences in this borderland of Western civilization, the outlines of which in state and church he tries to connect with the life of his hero ; there are many suggestive conjectures and possibilities, though not much can be said about Ninian himself, of course on account of lack of sources.

The chapter also on Ninian's missionary achievement is in my opinion more suggestive than convincing. Bede's mention of the ' southern ' Picts can hardly be made to refer to northern Scotland beyond the Mounth, nor do I see how his story of Ninian, who lived so many centuries before, should be more trustworthy than his account of St. Columba who was so much nearer to his times, and whose monastery was no less in touch with Northumbria (see Bede, *Hist. eccl.* v, 15), than Ninian's Candida Casa under Northumbrian rule ; sources of so legendary a character as St. Kentigern's ' Life ' have very little weight in comparison with Bede, though some exaggeration in the words of the latter on Iona may be conceded. Anyone acquainted with the extensive Continental research-work of recent years on church dedications will not be much inclined to trust conclusions which are drawn from them as to the life and work of the patron saint, his burial-place excepted. We need to consider how many possibilities of the origins of these dedications may have existed during the Dark Ages, not to speak of

linguistic difficulties which are here I think underrated. Bede and the eighth-century poem mentioned above show that Ninian was regarded as a saint in these times also. Consider for instance the influence of old Melrose; or could not early churches dedicated to Ninian, to mention another possibility, have been founded by a Christian Pictish king like Naiton (706–732): we know his relations with Abbot Ceolfrid of Wearmouth and Jarrow, whom he asked to send him architects, 'qui iuxta morem Romanorum ecclesiam de lapide in gente ipsius facerent', to be dedicated to St. Peter (Bede, *Hist. eccl.* v, 21)? *Ignorabimus.* Names such as St. Ninian's Den, St. Ninian's Well, St. Ninian's Field in the immediate vicinity of a Ninian church (pp. 99 f., 102) prove nothing as to the origin of the foundation; they are no doubt derived from the church's patronage. Many conclusions of the author seem to me therefore unwarranted, and too many possibilities are disregarded in favour of his hero, though the book is well worth reading for its suggestions.

A few details: in which early source is King Tudwall 'recorded to have been baptised by St. Ninian' (p. 20)? The poem and Ailred regard him as Christian, though a sinner. The name of the king of the Alemanni mentioned on p. 34 was Crocus, not Erocus (see e. g. Krusch's second edition of Gregory of Tours, *Mon. Germ. hist., Scriptores rer. Merov.* I, 1, fasc. 1, Hanover 1937, p. 24, n. 4). In the two maps at the end of the volume the name of Brampton (pp. 82 ff.) should have been supplied.[1] W. Levison.

ÉTUDES BYZANTINES D'HISTOIRE ÉCONOMIQUE ET SOCIALE. University of Jassy Studies in General History, no. IV. *By* G. I. Brătianu. *Paris, Librairie orientaliste Paul Geuthner,* 1938.[2] *pp.* 294 *and* 20 *plates.* 50 *francs.*

This volume collects articles by Brătianu, all in French, from many, often rather inaccessible, places. In time they range from the first centuries of the Christian era (with a glance or two even to classical Greece), through the whole Byzantine period down to the Ottoman régime in Constantinople and the 'Principalities', and the Russia of Catherine. The threads which hold them together are the interdependence of fluctuations in gold values and industrial prosperity, and the secular struggle between state control and private enterprise

[1] I use the opportunity of making a few additions to my article mentioned above. Page 281, line 5: after 803 there seems to have been at least one bishop of Whithorn more in the early ninth century; see K. Sisam, *Cynewulf and his poetry*, in *Proceedings of the British Academy*, 1932, XVIII, 326, n. 10; P. H. Blair, *Symeon's History of the Kings*, in *Archaeologia Aeliana*, 1939, 4th series, XVI, 97. Page 288, note 13: see also Watson, *Notes on St. Ninian*, in *The Evangelical Quarterly* 1933, V, 22. Page 289, note 16: On *plebs* see also Hugh Williams, *Christianity in Early Britain*, Oxford, 1912, pp. 289 ff.

[2] Not received by Antiquity until April, 1939.

in the eastern Mediterranean. The work is valuable as giving to Western historians an *aperçu* of the very different conditions prevailing in the East, knowledge which is important to them not least because the ' Besant ' was for centuries the standard gold coin of Europe, and which cannot easily be acquired without acquaintance with publications in out-of-the-way places and languages. And it is interesting too, to be reminded that serfdom developed on a large scale in eastern Europe just as it disappeared in the West. Brătianu suggests reasons, different for each country, and tilts at doctrinaire materialists' interpretations.

The author is evidently a historian who has ' got up ' his economics, and though he has done this well enough, the work is not free from the vagueness which afflicts so many studies of pre-modern economic history. When he has ' got up ' his history too, as in the early chapters he evidently has (all ancient references are confessedly second-hand), his work has a rather ' half-baked ' air, and there are some disputable statements ; these chapters might really have been omitted. He is in fact at his best when he stays most closely to the primary sources as in a rehabilitation of Nicephorus, an ' orthodox ' treasury official turned emperor.

Many of the chapters draw attention to an important point of Levantine history. The existence of a disproportionately large capital city, and the obligations of feeding it, forced the government into measures of state control, and the author describes incidents in the battle between the state and private interests, whether feudal *δυνατοί* or foreign industrialists. The battle was lost for Byzantium, to be taken up victoriously again by Mahomet II and the Ottomans. Their Black Sea grain fleet is strongly reminiscent of late Roman *navicularii*.

Most of the plates, giving delightful scenes of agricultural life from Byzantine manuscripts are, alas, quite irrelevant to the text ; the last three, however, illustrate an article in rather lighter vein, showing the far eastern origin of medieval Byzantine (and western European) costume. C. E. Stevens.

SARN HELEN : a Roman Road in Wales. *By* Morris Marples. *The Welsh Outlook Press, Newtown, Montgomeryshire*, 1939. *pp.* 45, *nine text-maps. 2s 6d.*

The Welsh Outlook Press has long shown an interest in the Roman roads of Wales. They form a neglected subject upon which much time and labour might profitably be spent. But the series of publications which have so far been issued by the Press cannot be said to serve usefully the cause to which they are devoted. Their introductory remarks quote the wise words of Haverfield only to neglect them ; for there has been little or no sign that any of Mr O'Dwyer's county surveys has the essential *practical* basis of field-work which

Haverfield demanded—indeed, it is doubtful whether their author is entirely familiar with even the more obvious characteristics of the roads of any period !

Mr Marples' little book marks an advance on the county series. He has chosen the one road (or series of roads) to which the name ' Sarn Helen ' has been applied ; and he has followed most of it from Caerhûn in the north to Neath in the south. Here at least there has been an attempt to make contact with the problems on the spot, which has been backed by reference to earlier writers, to whom Mr Marples has gone for the hints that only they can give, who saw the roads before enclosure, intensive agriculture and industrialization had effaced or buried them in many parts of the country.

For this much we can be grateful. But when our writer says that much remains to be done we can only agree with him. For the fact is that the essential work remains to be done. Mr Marples should now discard the one-inch map and the Ordnance Survey identifications, and get down to detail on the six-inch scale. His possibilities and their alternatives need to be followed up, not by walking between the hedges of modern metalled roads, but by getting outside them to examine the problems to which he himself draws attention, and especially to explore those very un-Roman kinks which are a feature of the difficult mid-Wales portion. This will be to convert pleasant walking into something resembling hard (and much of it almost certainly unproductive) work. But until someone will face up to this necessity, knowledge of ' Sarn Helen ' and the other Roman roads of Wales will remain in its present unsatisfactory state.

W. F. Grimes.

THE WELSH HOUSE : a study in Folk Culture. *By* Iorwerth C. Peate. Being volume xlvii of *Y Cymmrodor*, the Journal of the Honourable Society of Cymmrodorion, 20 Bedford Square, London. 1940. *pp.* xviii, 234 *and* 87 *plates*, 58 *text-figures*. 15*s*.

This lavishly illustrated book has been awaited by an increasing body of persons interested in the peasant cultures of Britain and their expression in building construction. The record of our farm layouts and farmhouses, of our cottages and crofts, dating from times when local traditions and local materials governed construction, is woefully inadequate. In this respect we lag far behind continental countries, though our material is, or was within living memory, ample enough. The lack of applied scholarship and University interest in these matters is deadening ; the writer of a well-illustrated book on the ' Cottages of England ' for example seems to regard any manor house or yeoman's house which has come down in the world as falling within this category. In his notice of the Westmorland volume of the Royal Commission on Ancient Monuments three years ago, the present reviewer remarked that there was

nothing to indicate that the importance of farm layouts as illustrating economic and cultural connexions, was or ever had been appreciated by the Commission, (though the scrappiest monastic layout was faithfully studied and recorded). Here, then, is the background to Mr Peate's book.

His introduction to the volume contains many sound comments on the general position; his approach and his intention may be gauged from one sentence. 'In such a country as Wales, incorporated since 1536 in a neighbouring virile state, the only national architecture is peasant architecture'. As an Englishman who has tried to familiarize himself with all types of architecture in Wales, of peer, squire, townsman and peasant, I think this is broadly true. But Mr Peate perhaps does not realize with what passionate zeal the English landowner has, generation after generation, himself gone overseas to less virile lands for architectural inspiration!

The first chapter in the author's book properly stresses the importance of the lithology of Wales, of her position in the Highland Zone of Britain, and of the geographically-enforced isolation of her communities, in any study of her architecture. He then deals with the circular house as revealed by excavation, and the later history of round houses; the 'ink-bottle house' of squatter districts and the still-surviving round pigsty are well worthy of notice. The pig, says the author, is the only domestic animal who could comfortably be accommodated in the beehive hut of early man; indeed it is peculiarly suitable for him. Having chased (or been chased by) a large specimen round and round the sty figured in Mr Peate's plate 4, the reviewer can only agree; with this reservation, that the accommodation is inadequate for both species together.

The next chapter deals with the rectangular house, but why does the author not survey the history of the type in Wales as he did with the round house? The deep impression made by the Roman house on the native consciousness is shown, e.g. at the palace (?) of Din Lligwy in Anglesey, and persistence of the type into the Dark Ages at Pant-y-saer in the same county. The first type of rectangular house here studied, then, is the Long House*—a central-chimneyed type in which man and his cattle are accommodated under one roof, with a passage leading from kitchen to cow-stalls and with entry to the dwelling-half by way of the cattle-feeding-walk only. The building may be anything up to 90 feet in length. In an interesting series of photographs and ground-plans variations of the type are indicated, and the range in Wales of this moorland house is discussed. The author pays tribute to the exhaustive study given to a number of these houses forty years ago by the Royal Commission on Land in Wales, chiefly through the insight of the late Sir David Lleufer Thomas, to whom the book is dedicated. The one- and two-roomed cottage next claim

* For Mr Peate's article see ANTIQUITY 1936, XI, 448–59. EDITOR.

attention, particularly the latter, with its ' croglofft ', a half-loft over the bedroom reached from the kitchen by a movable ladder. In West Wales and Anglesey the type is dominant, for in many parts one may see dozens, possibly hundreds in a day's walk ; it is comparatively rare elsewhere in the Principality. This is due, says Mr Peate, to more extensive rebuilding and replacement in certain counties than in others (p. 112), but the reviewer, who published a different view, is not yet convinced that the intensity of the coastal distribution can thus be explained away.

In a chapter entitled ' Some stone and half timbered houses ' Mr Peate first illustrates from Romilly Allen's paper the remarkable series of stone farm-houses in Pembrokeshire. He argues that the type they represent is basilical, and derived from the wooden house, probably correctly ; but one cannot let the suggestion (p. 168) pass that this conclusion in any way challenges that arrived at by Allen. ' The most remarkable feature in the construction of the houses, writes Allen, ' is the device adopted for increasing the area of the ground floor without the necessity of making a roof of unduly wide span. This is done by adding what may be termed side aisles '. This is, surely, an accurate description of the ideas that lie behind basilical construction.

In dealing with the half-timbered house, Mr Peate's practice does not accord with his admirable principles. The peasant and the ' Study in Folk Culture ' seems to be forgotten ; he refers to town houses and houses obviously of the gentry and aristocracy, and even devotes half a dozen of his allotment of illustrations, precious for his proper purposes, to such. He could easily have maintained the unity of outlook of the book by studying and illustrating the manifestations of half-timber technique in Welsh farmhouses and cottages only.

The most important achievements in the book are the insistence on the interest and significance of the Long House, and on the ' cruck ' roof construction as a Highland Zone technique, widespread in Wales from an early date. The reviewer is disposed to revise his ideas on the character of the roofs described in the Welsh Laws after reading Mr Peate's learned interpretation of the literary evidence ; crucks, not central posts, seem to have been the supports described. But having effectively presented this latter proposition he supports it by introducing a series of illustrations of a house described in *Archaeologia Cambrensis* many years ago, which is stated to have roof principals springing ' direct from the ground '—crucks in the original account—but which, in the example which can be checked, manifestly has nothing of the sort, but a crazy array of supports including central posts. Of the persons who prepared figs. 32 and 35, reproduced by Mr Peate, one was inventing. Whether our criticism be correct or no, something needs explaining, and the failure to attempt this suggests insensitiveness to the practical aspects of construction. The Long Houses, moreover,

are of the greatest importance ; but none of the fourteen illustrations to the chapter thereon have a proper scale, they do not differentiate between original and later work, and there are no drawings illustrating the construction of these buildings. Again, in a constructional matter the author misquotes his authority, Harold Hughes, an accomplished antiquary and architect, describing as a three-piece truss-construction what Hughes records as a two-piece (p. 189). He should have recognized the sort of principal Hughes had in mind, for there are eight complete trusses of the type at Maes-y-Bidiau in Carmarthenshire, illustrated in his book (plate 25).

Why is this ? Let us turn to the contents table of the book : Introduction, Building Material, House Types, last of all, Building Construction. Here lies the explanation : Mr Peate's cart is in front of his horse. In the chapter on Construction, moreover, the subject is treated perfunctorily. There are many roof types, but the only one dealt with is the cruck ; and its devolution is, Mr Peate says, ' a story with which we are not concerned ' (p. 189). But those who are interested in the ' Welsh House ' cannot help being concerned with such details. They are overwhelmingly important in a peasant country where simplicity and absence of ornament make the dating of buildings difficult. And as these changes in the cruck roof seem to have started not later than 1600, they are potentially relevant to the study of nine out of ten buildings one comes across in Wales.

The criticisms in this review are penned in no carping spirit. Mr Peate has set his hand to a task of urgent and vital importance, for which he has important qualifications. He is the pioneer in the study, on a fully national basis, of folk culture as expressed in Welsh houses. Construction—its exact record and description—as well as planning, represents the grammar of the new language he is teaching us—the tongue in which the folk buildings of Wales tell their story. We cannot profit by an advanced course until all the elements are grasped.

CYRIL FOX.

DIE BRONZEZEIT IN NORDMAINISCHEN HESSEN. *By* FR. HOLSTE. Vorgeschichtliche Forschungen, Heft 12. *Berlin : Walter de Gruyter & Co.* 1939. *pp.* 196, 35 *plates* (*including* 8 *maps*). RM. 14.

In his introduction the author points out that in recent years research on the Bronze Age of southern Germany has not advanced to any considerable extent, and that this culture-phase labours under the disadvantage of a vague generalized conception of its geographical limits. It has been usual to speak of a 'South German Bronze Age ' or the ' Bronze Age of the zone north of the Alps ', and allowances have not been made for regional differences in the large

area included under these descriptions. This monograph is intended to supply the want in respect of one of the component areas. In general the author does not confine himself to arbitrary administrative boundaries but rather discusses an area which may be described briefly as the ' Zone north of the Main '. This course may be regarded as justifiable because present-day geographical divisions in any country differ notoriously from natural regions and may have no significance in the study of prehistoric distributions. Nevertheless, in the study of a set locality, some indication should be given of the bounds which the worker has set himself, and for the benefit of the reader not thoroughly acquainted with German topography the failure to delimit the area under consideration on a map is a lack in this volume. The author shows the distribution of the various types on a series of maps some of which cover most of the Rhine valley, the plan being to trace the area of distribution of most of the important bronze types found in Hesse. The inventory of finds given as an appendix indicates the area with which the author is primarily concerned. The finds listed come from the administrative districts (*Regierungsbezirke*) of Wiesbaden and Kassel, while those of Oberhessen are omitted as being already available in Kunkel's *Oberhessens Vorgeschichtliche Altertümer.*

The book opens with a general consideration of the evidences of settlement in Bronze Age times in relation to the natural features, and it is noted that settlement in general is found not on the löss of the plains and river valleys, but on the (today) forest-covered heights. Water supply was of evident importance and, in the absence of the relevant pollen-analytical research, the author inclines to the theory that this was so because of the warm optimum which caused the inhabitants to seek the surer supply near the sources of the streams rather than that of the lower valleys. Unfortunately, evidence of settlement derives mainly from burials, habitation-sites of the period being almost entirely lacking. Hence the chief portion of Fr. Holste's thesis concerns itself with burials. Almost all the burials are in tumuli, but beyond this fact, considerable variety of burial-rite is manifest. In eastern Hesse stone kerbs and inner stone-settings are noted while in the western region these are extremely rare. Cremations are very exceptional. The urnfield culture is not included in the survey, the author following Reinecke in excluding this phase from the Bronze Age.

The Early Bronze Age is not well represented and is briefly dealt with. It is a weak culture phase, having connexions with the Aunjetitz area. The finds from the developed Bronze Age are dealt with in four sections : types from men's graves, those from women's graves, objects of utility and pottery. Chapters follow on the general aspect and origin of the Hesse groups and on chronology. The various types are dealt with in some detail, from the viewpoint of typology and distribution, and the maps provide welcome additions and corrections to

the now very much out of date *Typenkartenbericht der Deutschen Anthropologischen Gesellschaft* (*Zeit. Ethn.* 36, 1904).

The principal conclusion forthcoming from the study of the Bronze Age in Hesse (or rather of the tumulus culture in Hesse) is that the area under consideration may be divided into two cultural regions : west and east. The former region is closely connected with the Middle Rhine, while the latter is a more uniform and independent culture, having, however, connexions with northwest Germany. Here again a lack is a map showing the extent of these two cultural regions.

In the discussion on chronology the author deals with various schemes of Bronze Age chronology and then provides a two-fold division of the Hesse material on the basis of the grave goods.

The book is well documented and deals with much hitherto unpublished material. One would wish for more and better illustrations of the grave structures. It provides a useful addition to the literature of the German Bronze Age.

S.P.ÓR.

THE MAKING OF EGYPT. *By* Sir Flinders Petrie. *The Sheldon Press. pp.* xv, 188, *including* 82 *plates.* 12*s* 6*d.*

This book aims at delineating the various racial elements that from predynastic times onwards united in the people of Egypt and produced its epochs of greatness. Speculation about origins is always a fascinating occupation, and the opinion of one who in a life-time has achieved more than anyone else in the service of Egyptology is to be given full consideration. We welcome therefore another work from the pen of the Grand Old Man of Egyptology, even if some of the views in it appear to the ordinary mortal to be Olympian and difficult to grasp.

Is it certain that the material and cultural progress of a people can be correlated with their physical make-up ? To some extent there must be a relation. No doubt there was negro as well as Mediterranean blood in more than one of the great historic dynasties of Egypt. In the Sudan, where this review is written, there are many varying blends of the Mediterranean race with the negro, besides pure examples of both races. One outstanding characteristic of the negro is his readiness to adopt the outward forms of foreign culture, combined with an apparently contradictory quality, whether conservatism, lack of initiative or something else, which lead to the retention of institutions once adopted and their unintelligent repetition for centuries. Pure examples of the Mediterranean race, whose ancestors have taken to the nomadic life, seem to be equally conservative and less adaptive, such is their traditional pride in their way of living. It is those blends of the two races which show the greatest

proportion of the Mediterranean race in their make-up that appear to have the greatest mental powers and so to be most capable of progress.

It is contact between races and cultures that is especially responsible for progress. Isolation spells stagnation. It goes almost without saying that many must have been the contacts between peoples responsible for the great periods of Egyptian history and culture. Sir Flinders Petrie himself has done more than anyone else to make those contacts clear to us, and he would be the first to recognize that much more work remains to be done by those that come after him, before all the details of the picture can be clearly seen.

In this book he draws particular attention to the value of clues to be derived from the recognition of racial portraits. We may not always agree with him—(to the reviewer the types given on plate LXIII, for example, do not appear to be peculiar to the Galla)—but we cannot fail to be stimulated by his youthful originality of outlook. A. J. ARKELL.

PREHISTORY. *By* A. VAYSON DE PRADENNE, *translated by* ERNEST F. ROW. *London : Harrap*, 1940. *pp.* 240. 6*s*.

We should be grateful to the publishers and to the translator for this readable English version of our late French colleague's introductory text-book of prehistory. In small compass and at a moderate price the book gives a beginner an admirable conspectus of the aims, methods and outstanding results of this branch of archaeology as viewed by the ablest exponent of the classical French school. Its appearance reminds us of what a loss our science sustained in the premature death of this promising exponent.

The book is divided into three parts, really devoted respectively to methods in general, the culture-sequence in Western Europe taken as a standard, and results in other areas. By the definitions laid down in chapter I the subject is circumscribed by consigning to proto-history the Bronze and Early Iron Ages which in Britain and generally outside France are regarded as important divisions of prehistory. The second chapter gives a generalized account of the nature of the geological, archaeological, palaeontological and anthropological evidence, including an instructive diagram illustrating three possible theories of the relation of *Pithecanthropos* to the anthropoids and man respectively. A chapter on the search for documents contains illustrated explanations of solifluxion and of the formation of river terraces, hints on how to excavate a cave, remarks on ' pit-dwellings ', shell-mounds and lake-dwellings and a compact synopsis of the genesis and growth of frauds based on the author's well-known study. The chapter on technology which concludes part I is devoted mainly to flint work.

Part II begins with a brief history of prehistory, doing full justice to Plott,

Frere and Geikie. In the next chapter under the heading, ' geological classifications ', glacial phenomena are explained with illustrations, and the systems of Geikie, Penck and Bruckner, and Déperet are expounded. The archaeological classification is that of de Mortillet, enlarged, of course to contain the Aurignacian in its three subdivisions, the Maglemosean, Vouga's subdivisions of the ' lake-dwelling neolithic ' and Montelius' ' Nordic neolithic ' series. A particularly valuable feature is the relative prominence given to the Stone Ages in the Far East, Central and South Africa as well as the Near East, since these areas are too often entirely ignored by English writers.

The whole book is surprisingly conservative, and the outlook essentially evolutionistic and anti-historical. Clactonian and Levalloisian are just mentioned, but Breuil's views on the relations of core-tools and flake-tools are rejected. We are instead warned against ' unwarranted simplifications from which is formed an armchair science whose conclusions are both complicated and uncertain '. So the subdivisions of the Aurignacian are left as stages ; Peyrony's terminology is just mentioned, but not that of Garrod, still less its implications. The concept of cultures and culture-cycles is not even alluded to so no account of neolithic cultures is to be expected ; the Nordic neolithic is in fact represented by the megalithic culture to the exclusion of separate graves and dwelling-places. Some statements are not only conservative but absolutely out of date. It is implied that all Upper Palaeolithic races in Europe were dolichocephalic. The culture-sequence given for Mesopotamia omits the important Uruk phase. The figure entitled ' neolithic industries of the Fayum', includes dynastic types. The ' tranchet ' illustrated among the ' double-sided pieces ' in fig. 10 is a core-axe sharpened by a *tranchet*-blow, not a typical *grand tranchet* at all. The translator is not always successful in dealing with technical terms ; he has invented ' terranes ', ' pollinic spectrum ', ' double-side ' (for *biface*), and used nipple for lug, rim for rib, covered ways for covered galleries, gull's wing blade for side-blow flake, throwing-stick for spear-thrower. Alfontova, Gaggarino and Ben Alter are nasty misprints. V. Gordon Childe.

DAS WIEDERERSTANDENE ASSUR. *By* Walther Andrae. *Leipzig : J. C. Hinrichs*, 1938. *pp.* 232. *Paper* 14 RM., *cloth* 16 RM.

The account of eleven years' excavations on the site of the ancient metropolis of the Assyrians is a landmark in Near Eastern archaeology in several respects. It is one which points backwards, rather than forward, since the excavations it describes took place before the outbreak of the war in 1914. It pays a tribute by its title (' Ashur Resurrected ', or the like) to another famous book *Das Wiederstandene Babylon*, in which Robert Koldewey several years ago summed up and described his spectacular excavations at the site of Babylon.

The important site of Ashur, now Kala'at-Shergat, it should be explained, is no discovery of recent years. As it lies on the main road from Mosul to Baghdad it would be hard to miss. Layard, the father of Assyriology, had noticed it, but his preoccupation with Nineveh and Nimrud in 1848–9 caused him to deny it his personal attention. It was excavated for him by his friend and representative, Hormuzd Rassam, a native Christian from Mosul and the brother of the British Consul there. The work was badly done and gave us little information of the variety of material which the mound contained. Our knowledge of Assyriology, meanwhile, remained mainly restricted to the later Assyrian empire of the 9th to 7th centuries B.C., as disclosed at Nineveh and Nimrud. At last, in 1903, the German Oriental Society, which had been excavating Babylon, but had found there also material mainly of a late period, felt the need of throwing more light on the older phases of Mesopotamian history. Ashur was chosen for the purpose, and was thought to deserve fresh excavation under more careful supervision than it had had at Rassam's hands. The excavators pursued their work annually with zeal and patience until interrupted by the war in 1914, and probed the citadel with trenches from end to end.

Their industry was suitably rewarded. Particularly in the quarter nearest to the river bank, remains of stately and important buildings were unearthed—great temples of the principal deities, Ishtar, Ellil, Anu and Adad, Ashur, Sin, Shamash and others, a Zigurrat, sundry palaces and royal and private tombs. Of these buildings the oldest was the temple of the goddess Ishtar, which in its first form carried the history of the city back to the beginning of the 3rd millennium B.C. Others were the work of kings of the 2nd and 1st millennium B.C., of whom in some cases we possess few other records. Numerous cuneiform texts of importance came to light and there were many interesting small finds. Amongst those which have hitherto received little notice, we may mention a beautiful figured alabaster vase with a design of a tree of life and handles in the form of lions (pl. 12), and a water-trough of the time of Sennacherib carved with figures of the God Ea and priestly ministrants (pl. 2).

Accounts of these discoveries appeared from time to time as the work went on. They were of two sorts—brief annual reports or large and detailed publications of isolated portions of the work. Neither were much help to general readers, the first because of their studied vagueness, the second because of their excessive detail. This deficiency is now made good.

In the planning of this book Dr Andrae addressed himself gallantly to the all too familiar difficulty—that of presenting the varied material in a scholarly way, yet one which would be understood by a non-specialist. He realized that for such a person ground plans and mere stumps of walls have not much meaning. Accordingly he divided his book into two parts. To the second, which contains

the archaeological description of the site, he prefaces an introductory portion in a lighter vein. In an imaginative scene reminiscent of that one-time classic Becker's Gallus, he introduces us to an Ionian mercenary of the 7th century B.C., one of many who could have come from Greece to Ashur at the time of its greatest splendour. All that there was then for the stranger to see as made known to us by these discoveries is described, and we are made to follow it through the stranger's eyes. In this pleasurable journey of the mind we have the help of very many views and sketches showing the buildings as reconstructed by the able pen of Andrae himself.

In spite, therefore, of an at times slightly forbidding scientific austerity which still remains, Dr Andrae's book will be indispensable, so long as archaeology is studied. It will also stand as a monument of German former excellence in the arts of peace. By the fruitful and devoted labour of Andrae and his colleagues the dead city of Ashur was again conjured up and took shape in human minds ; and it may be thought fortunate that the time sufficed for that majestic spectacle to be worthily and exactly noted and portrayed before the vision and the excavator's efforts crumble back again into shapeless dust in the turmoil and distraction of yet another collapsing world. R. D. BARNETT.

ROMAN PORTRAITS. With a foreword by L. GOLDSCHEIDER. *Phaidon Edition. George Allen and Unwin*, 1940. *pp.* 14 *with* 120 *plates.* 10*s* 6*d.*

The 120 full-page plates of this volume give a selected series of Roman portraits covering the five centuries from the end of the Republic to the fall of the Western Empire. ' Roman ' is interpreted to mean the art of the capital, for with one or two exceptions the provincial popular art referred to in the chronological survey is not illustrated. The scale of the book (large quarto) allows reproduction of the heads at approximately life-size, and the excellent photographs make it possible to study technical and other details as well as the general appearance of the sculpture. The title is misleading, as the choice is practically confined to free-sculptured heads in stone or bronze, with a few (and those late) from reliefs. While the exclusion of portraits on medallions, coins and gems is understandable in view of the difference between the two arts, the omission of any portraits from Imperial and other monuments is difficult to explain. Examples such as the head of Augustus from the Ara Pacis (or if this be thought too damaged one of the members of the Imperial Group) and the Severan reliefs of the Porta Argentariorum, would have been invaluable for comparison with the heads in the round which are so well illustrated. Neither the introduction, nor the brief chronological survey, attempt to discuss the plates. The former sketches the general trends in the development of Roman portraiture. The use of the adjective Flavian (p. 13, =69–117 and plates =54–117) does not

inspire confidence in the survey, which is unnecessarily brief and misleading. The full notices in the English press recording the inauguration of the restored Ara Pacis Augustae on the banks of the Tiber in September 1938 should have saved the statement ' vestiges of which have been assembled in the Museo delle Terme '.

C. A. R. RADFORD.

GUIDE TO THE COLLECTION ILLUSTRATING THE PREHISTORY OF WALES. *By* W. F. GRIMES. *Cardiff*, 1939. (National Museum of Wales and University of Wales Press Board). *pp.* xv, 254 *with* 78 *figures*, 9 *plates*. 4*s*.

Sir Cyril Fox, Director of the National Museum of Wales, sketches in his preface to this volume the history and growth of the Collection here catalogued. He explains how ' generous gifts and long loans from public and private sources, and purchases of original specimens, have been supplemented by the acquisition of electrotype copies of precious relics from Wales possessed by the older museums of Britain', so that now the Collection is representative of the life of Man in Wales from the earliest times to the Roman conquest. Under the sure guidance of the Director a stage has now been reached when a comprehensive catalogue is not only justified, but an actual necessity. The task has been entrusted to Mr W. F. Grimes, formerly Assistant-Keeper of the Department of Archaeology in the Museum. The catalogue includes all material housed in the Museum down to the end of 1937.

The production of such a Guide is never an easy piece of work. Its difficulties are increased in the case of a relatively recent collection like that of the National Museum, which has been gathered together more or less by chance, and for which the results of systematic research have only become available within comparatively recent years. Any such Guide must fulfil three essential functions. First, the layman needs an easily readable and easily intelligible introduction to the exhibits in which the cultural development of the region is treated in close geographical connexion with the sciences kindred to prehistory. Secondly, the specialist looks for a thorough handling of the material and the various problems involved, covering the results of the most recent research. Both these demands naturally entail a range of knowledge on the part of the compiler which cannot be confined to the specific Collection in question. Thirdly, such a Guide must form not only a reference-book for the use of visitors to the Museum, but must also meet the needs of those scholars who use the material of the Collection in their research but have no immediate access to it. Mr Grimes shows in the arrangement of his work that he is fully conscious of these three fundamental points, and his admirable production should serve as a model of its kind. Besides his natural gift for clear exposition he has the skill of a talented draughtsman, so that original diagrams, clear plans, and exact copies of

the material illustrate the Guide in a manner that is all his own ; drawings such as (e.g.) fig. 26 (types of Bronze Age moulds) will gain a place in all handbooks. Figures from earlier publications are used only to a limited extent. The plates include also some good and carefully-chosen examples of monuments and landscapes, which help to avoid that monotony which can so easily attach to the mere accumulation of finds.

Part I (pp. 1–128) is in effect a handbook to the prehistory of Wales. The specialist will find in it an exhaustive account of the subject in its manifold relations with England, Scotland, Ireland and Western Europe ; the discussion naturally ranges far beyond the scope of the Museum collection. There is not only much that is new, but clear evidence is afforded of the advances made since Wheeler's *Prehistoric and Roman Wales* was published in 1925. On the other hand, it becomes obvious what great tasks still await those engaged in the archaeology of settlement-sites, and how far we still lack a really living picture of cultural-historical development. It is remarkable, though not the fault of Mr Grimes, that no single ground-plan of a house is available, much less a plan of an excavated settlement.

Part II, the Catalogue (pp. 129–202), satisfies all the basic principles of a Museum inventory, with the necessary evidence for *Quellenwerk*. Here the individual treatment of the contents of the Museum supplements the historical account given in Part I. A general Bibliography is appended, while the special literature relating to the finds is mentioned under the appropriate entries in the Catalogue. There is a topographical index arranged by counties, which presents certain difficulties to those not familiar with the geography of Wales—one would have preferred a comprehensive alphabetical index with the name of the county added after the place-names. The subject-index, like the topographical index, includes references to the illustrations also ; it is well arranged and most useful. It would have been helpful if a map of Wales had been added. Large-scale maps are obviously lacking because they are to be found in another of the Museum's publications, Sir Cyril Fox's *The Personality of Britain*. In view of the excellent arrangement of the material in the Museum, a plan in illustration of it would also have been of advantage. The book is admirably produced, and Mr Grimes and the Museum alike may well be proud of it.

G. Bersu.*

* Translated by R. G. Austin.

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